The Income Distribution Effect of Medical Insurance in Ontario

Ontario Economic Council

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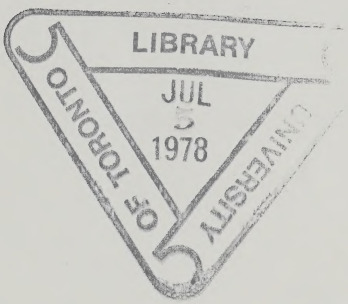

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Chapter 1

The nature of the distribution study

INTRODUCTION

Universal public health insurance schemes, such as the hospital and medical insurance programs in Canada, have frequently been justified on the grounds that society should assure ready access to health care services to all its citizens on the basis of medical need and not on their ability to pay for such services. These programs were founded on the principles of universalism, comprehensive coverage of health care services, and minimal, if any, constraints on consumer demand. The most notable implication inherent in these objectives was that the public purse should underwrite virtually all the demand for hospital and medical services.

A number of interesting economic questions can be raised about the effects of these programs. One of them concerns the changes in the distribution of hospital and medical services between different population groups due to the introduction of insurance programs. Another question is the effect of the programs on the redistribution of income when both the monetary value of the services provided and the costs of financing them are incorporated into the concept of income. A similar but less ambitious question is to discover the utilization of medical and/or hospital services and their value to various population groups during the life of a program. Essentially this approach is taken in the present study. However, only the medical insurance program in Ontario is considered for analysis, because for reasons to be explained below a satisfactory analysis of the hospital insurance program in Ontario was not currently feasible.

The analysis undertaken here has features of two different kinds of studies which have a great deal in common when it comes to analysing the public medical insurance program of

Ontario. To health economists, sociologists, political scientists, and policy-planners this work may seem a health care utilization study, and therefore be interpreted as an examination of access to health care, or at least as relevant to the issue of access. The objective of a typical utilization study is to explain the use of health-care services (usually expressed in real terms such as physician contacts, visits, hospital bed-days, admissions, or discharges) in relation to a number of socioeconomic, demographic, and other characteristics of a population. On the other hand to public finance economists interested in the distributional effects of public expenditures this work will seem a benefit incidence analysis, addressed primarily to the question of who benefits from the public expenditure incurred by the medical insurance program and by how much. The population in such a study is typically defined in terms of per capita or family incomes, although alternative categories of age, sex, location of residence, family size, and so on may sometimes be adopted. The amount is the dollar value of the services provided by the expenditure programs to the various beneficiaries.

OBJECTIVES OF PUBLIC HEALTH INSURANCE PROGRAMS: INCOME DISTRIBUTION AND EQUAL ACCESS

One of the major objectives of a public health insurance program is to affect the distribution of real incomes. Public financing of health care is increasingly seen as fundamentally a policy of redistributing income from the non-poor to the poor, except that the redistribution takes place in kind rather than in general purchasing power (Blumstein and Zubkoff, 1973).

To be sure, there is an extensive and controversial theoretical literature attempting to justify the public provision of health care services on grounds of allocative efficiency. For example, Arrow (1963; 1965) has argued for government intervention because of the uncertainty in the demand for and supply of medical services and the presumed lower transaction costs for public insurance in comparison with private

insurance. Weisbrod (1964) pointed out that optional demand characteristics of health facilities may make purely private provision suboptimal. Pauly (1971) has examined the implications of various externalities in the medical care market. A treatment of these and related issues is not attempted here, however, because they are not directly relevant to the current topic.

It can be demonstrated from welfare economics that specific subsidies or in-kind transfers are less efficient methods of redistributing income than money transfers, because they involve interferences with consumer preferences which lead to distortion in resource allocation. But this view ignores 'taxpayers' sovereignty' and the interdependence of utility functions. It is important to consider society's desire to interfere with the pattern or inequalities of consumption that would result from market determinations. Society may well choose not to ignore inequalities in both income and consumption.

The argument often made is that, rather than poverty itself, the consequences of poverty in the 'inadequate' consumption (relative to some social or technical norms) of certain goods and services such as education, medical care, and housing are what impose external diseconomies on the non-poor members of society. Thus, while ordinary citizens may be reluctant to finance substantial money transfers, they are probably willing to finance specific transfers (Buchanan, 1968). Whereas money transfers may be preferred to in-kind transfers by the recipient, in terms of welfare gains the latter may be preferred by contributors. While such transfers may or may not presuppose paternalistic attitudes, based on the assumption that recipients have inadequate information or expertise to evaluate options, they necessarily involve constraints on consumer preference by taxpayer preferences. The relative efficiency of the two forms of redistribution cannot be judged independently of the redistribution objectives of society and can only be decided through a political process.

The theoretical underpinning of such in-kind redistribution is the postulate of interdependence of utility functions. The hypothesis is that the non-poor receive satisfaction from and hence have external demands for the consumption of health care by the poor and the medically needy. Such externalities cannot be effectively translated (internalized) through the normal market mechanisms. Private efforts through charities and voluntary organizations, price discrimination by physicians, and so on involve free-rider situations and make suboptimal results likely. The avoidance of free riders may necessitate compulsion.(1)

One further argument for a universal compulsory public insurance of health care services may be briefly described. The fundamental objective of health care policy is usually taken to be 'equal access' to health care services; individuals are said to have a right to health care. Many expressions of this goal are utopian and vague,(2) but a common economic element is that health care should be provided free of direct charge to individuals on the basis of medical need. Individuals are assumed to value equal access to health care, and the amount an individual is able to spend is not expected to be relevant in determining how much care is received. Such a conception of equal access naturally entails free provision of health care,(3) the most extreme definition of equal access. Even so it is usually recognized that health care will still be rationed on some non-price basis, such as waiting time, opportunity cost, geography, and so on. The advantage of free service is simply that it helps avoid discrimination according to income; that and that alone is the problem it solves.

1 This does not mean of course, that public provision will be necessarily optimal.

2 For example: 'as a nation we [should] now take the necessary legislative, organizational and financial decisions to make all the fruits of health services available to all our residents without hindrance of any kind' (Royal Commission on Health Services, 1964, 10).

3 For a theoretical economic justification see Lindsay (1969).

A related argument for universal compulsory public insurance of health care is that, without it, dual systems will develop (or persist) - one for the relatively affluent, another for the poor. A non-universal system, one that excludes better off citizens from receiving government support, it is claimed, may result in inferior care for the poor, second class medical care for second-class citizens. Equality in this view demands compulsory universal public financing. This argument usually presumes that non-compulsory or non-universal government insurance for health would be for 'basics', with quantitative and qualitative inequalities remaining for additional services. Thus most proponents of compulsory government insurance insist that health coverage be comprehensive and that equality of access (usually meaning an absence of price or money barriers) be particularly stressed.

Clearly equal access as defined above essentially redistributes income from the non-sick to the sick. Other things equal, it is also redistributive between different income groups if we assume that the prices for medical services have a relatively greater deterrence on the poor or that the poor have greater health care needs relative to the non-poor. The distribution of health care services in relation to income class or its proxies therefore becomes a special case, or more accurately a particular emphasis or interpretation, of the more general concern for equal access.

Thus an obvious common ground exists between the income redistributive and equal access objectives of the public medical insurance, and a similar relationship can be expected between utilization and incidence studies. One type of utilization study attempts to evaluate empirically the extent to which public health insurance programs attain equal access. Its primary concern is with the consumption of health services by the various socioeconomic population groups. Certain public finance studies, referred to as budget incidence studies, attempt to quantify the effects of public expenditure programs on income distribution. In the case of the public medical insurance program, such incidence studies attempt to estimate

the income effect on the different socioeconomic groups due to their consumption of medical services provided by the program. A brief discussion of such studies follows in order to give some idea of the nature and dimensions of the present analysis.

STUDIES OF ACCESS TO HEALTH CARE

Equal access has been generally ill-defined and quite often undefined. There are of course a number of alternative concepts. Empirical definitions of access have perhaps been even rarer than formal definitions, simply because of the notorious difficulties involved in measuring it. Possibly these problems derive from the innate complexity of a concept that is more a political than an operational idea.

Of the definitions and measurements or indicators of access in the literature, two major themes are evident.(4) Most researchers probably tend to view access as a question of the characteristics of the population (family income, family size, education, occupation, insurance coverage, attitudes toward medical care) or of the health care delivery system (the physical availability of physician and related manpower and hospital facilities).(5) Such characteristics appear as 'process indices', which are better viewed as descriptive or explanatory variables than as synonymous with utilization itself. In utilization analysis, therefore, such indices are independent variables.

Other analysts have suggested that access is best defined and measured by 'outcome indices' of the individual's use of the health care system. Such indices are measured in terms of

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4 For an excellent, comprehensive discussion of the alternative concepts and a review of the literature, see Aday and Andersen (1975).

5 The term 'delivery system' refers specifically to the arrangements of resources for the potential rendering of services to the population-at-risk. As such, it has three main elements: the quantity of resources, their geographical distribution, and their organization.

utilization rates of medical and hospital services. In chapter 5 outcome indices for physician visits, encounters, and the like will be used as dependent variables.

Process indices, as mentioned, refer to characteristics of the population-at-risk and the delivery system that affect or determine people's utilization of or satisfaction with care. Implicit in the idea of process indices is the premise that some individuals may have more or less access to health services than others. The characteristics are mainly given biological or socioeconomic facts that determine the individual's utilization of health services, and they can be grouped into predisposing, enabling, and need components (Anderson and Newman, 1973). The predisposing component includes variables that describe the individual's or family's propensity to consume services. Age, sex, and family size are considered to be the most important, but it may also include race, occupation, religion, and values specific to health illness. The enabling component includes variables that describe the means available to individuals or families to use services. These include resources specific to an individual or family (income, insurance coverage, education) and attributes of the community (rural-urban character, region). The need component refers to the illness level as perceived by the individual or evaluated by the delivery system. Either one of these, of course, is the most immediate cause of health care utilization.

Other process indices are related to the health care delivery system. It can be argued that the availability of physician and hospital resources will affect the utilization of health services. The 'regular source of care' has been suggested as one such index, possibly determining the type, site, volume, and continuity of care, as well as patient satisfaction. The time taken and distance travelled to obtain medical care could also be examined as affecting the choice of care site and, more importantly, the volume of services consumed. Inconvenience, as measured by two indices, 'waiting time to make appointments' and 'waiting time in doctor's office before being seen by the doctor', is likewise believed to

affect the demand for and the satisfaction with health care services (Enterline et al., 1973).

The present study uses a number of process indices. For example, with reference to the characteristics of the population-at-risk, predisposing variables such as age, sex, family size, and occupation, among others, will be included in the analysis as independent variables. Without yet discussing these variables and the manner in which the information is gathered, it must be pointed out that certain characteristics can be very difficult to establish. Some of the most elusive ones are the knowledge people have of disease and of when, where, and how to seek care, their attitudes toward health and the delivery system, and especially their health needs or status. Other process indices included in the analysis, usually referred to as enabling variables, are family income and the education and employment status of the head of household and spouse. Process indices relating to the health care delivery system will include the relative availability of physician and hospital resources, the distance one must travel to obtain care, and the time taken getting an appointment, travelling, and waiting at the physician's office. The advisability of using such variables in utilization studies can be argued a priori as well as from past studies.

Implicit in the outcome-indices approach to access is the need for some external validation of the effects of the characteristics of the population-at-risk and the delivery system. The volume and pattern of the actual utilization of the health care system must be used to test the predictive validity of the access indicators. Four types of outcome indices appear in the literature: use in relation to need for care, continuity of care, satisfaction with care, and conventional utilization (volume).

Access to medical care may be a simple matter of whether people who need care receive it (Boulding, 1966). But how can that be measured? Existing morbidity and epidemiological data are inadequate because they are not usually collected for groups independent of their use of physician services. Three

alternative need-related outcome indices are proposed here and may be briefly described as follows. The 'use-disability ratio' is an attempt to integrate into a single measure the rate of use and the need of a population. This ratio has as its numerator the number of physician visits in some specified period (often two weeks) made by an individual who had at least one disability day in that period; the denominator is simply the number of disability days in that period for that individual. The 'symptoms-response ratio' measures the discrepancy between the actual number of visits to a physician for a given mix of symptoms and the estimates of the number of visits that should occur for these symptoms as determined by a panel of medical experts. Finally, the 'medical severity index' attempts to measure the fact that some population subgroups delay seeking care longer than others, so that their need for care may actually be greater. Thus, when they do contact a physician they may have to visit him more often. This index is derived from physician evaluations of the medical urgency of the conditions of people who saw a physician in a given time period. For example, the diagnosis may be classed as elective care only, mandatory care only, or elective and mandatory care.

An important aspect of the utilization of health services is the continuity of care experienced by patients (Richardson, 1971). The pattern of care seeking in response to a given episode may be described by the number and type of providers seen to get the illness episode resolved, by the number of visits to each provider, or by the reason or source of referral to each provider. These are use-continuity measures and may vary by the type of illness episode being considered. Another way to determine the continuity of care of an individual is to look at use of emergency or out-patient departments for primary care. This may be obtained by asking an individual what should be done with a selected medical condition, that is, what steps should be taken and where to get it treated.

Consumers' own assessments of the care received and the performance of the delivery system are also important in

evaluating their access to health care. Individuals were asked their opinions about such matters as convenience of care, its availability, information, quality, and out-of-pocket costs. It is not easy to interpret the responses, but it may be possible to construct more integrated measures of the various dimensions of satisfaction for the purpose of analysis and interpretation (Edwards, 1957).

To evaluate a medical insurance program in terms of indicators such as the use-disability ratio, symptoms-response ratio, or the medical severity index would clearly be highly desirable. However, it is equally clear that the information, the time, and the cost would be great, especially for a large population. Thus, most empirical studies on the utilization of health services use conventional outcome measures, which quite often are highly aggregative. These typically include the percentage of a group not seeing a physician during a specified period (usually twelve months), the number of physician contacts or visits during a year, and the number of admissions, discharges, or patient-days in hospitals. There are a few Canadian health care utilization studies using some of these conventional indices, and the more recent ones will be reviewed in the next chapter. Like these earlier works the present study also considers the conventional indices, but, data permitting, a number of the more disaggregated outcome indices are used in addition, such a physician encounters or visits by type of service (major surgery, minor surgery, laboratory services), by type of physician providing the service (general practitioner, specialist), and by location where the medical services were provided (physician's office, hospital in-patient, hospital out-patient, emergency, clinic, home).

BUDGET INCIDENCE STUDIES

Attention has recently been focussed on the expenditure side of the budget - an area largely unexplored only a few years ago. In a recent survey on the subject, McClure (1974, 2) concluded:

> Not surprisingly, economists who have tried to quantify the distributional impact of public expenditure have found themselves confronted with gaping holes in methodological and theoretical underpinnings necessary for their estimates. In part because of the relative neglect the subject has suffered, and in part because of the inherently greater difficulty of answering the questions posed, the methodology and theory of estimating benefit and expenditure incidence is largely undeveloped, though some inputs into the analysis may be drawn from other areas of research. Thus most authors have proceeded to make their estimates without satisfactorily addressing themselves to the thorny basic issues. In many cases they have explicitly recognized, defined, and then backed away from, the problems, but in others they seem to be oblivious to them.

The present study is cast in a distributional, not a redistributional, framework. The essential questions being addressed are: who receives the medical services provided by the public expenditure program, and what is its value to the recipients, given the existing tax-expenditure system?

There are two ways to analyse the distributive effects of a public medical insurance program. First, one may compare the distribution of services between various population units before and after the implementation of the program. An example of such a study is reviewed in the next chapter. Secondly, one may with a fiscal incidence study measure the change in income positions of families, usually grouped by income size classes, due to the taxes (costs) and the expenditures (benefits) implicit in the program under consideration. The operational content of such studies is to compare two income distributions, of which one is the actual or a modification thereof and the other incorporates the results of the budget incidence analysis.

A survey of the literature on fiscal incidence is not attempted here, but rather a brief outline of the various types of incidence studies in order to place the present study in context. Of the three general kinds of incidence analysis, the first, specific or absolute incidence analysis, contrasts the distributional effects of a particular public expenditure with

a situation in which that program is absent but everything else, that is, taxes and expenditures, remains unchanged. Such absolute estimates therefore indicate approximately the income loss to be expected by the various subgroups of the population if the particular expenditure program was to be removed with no attendant fiscal changes. This approach ignores the contractionary macroeconomic effects of an unbalanced reduction in public expenditure programs, which naturally influence both the level and the distribution of income. The second type, differential incidence analysis, solves that problem at least. A comparison is made between two equally costly expenditure programs, that is, within a given situation where a particular program is replaced by a different one, the change involving no resource transfer to the public sector and imposing no net burden on the private sector.(6) This approach makes necessary a comparison of incidence of two programs but avoids the problem of changes in total demand of unbalanced budget changes implied by the absolute incidence approach. The third approach to incidence analysis solves the demand problem of absolute incidence analysis by examining a balanced-budget incidence of equal changes in expenditures and taxes. Examples of this approach may be seen in attempts to determine simultaneously both who benefits from expenditure programs and who pays the taxes to finance them. The results allow the analyst to discover who is a net contributor and who gains from the implied fiscal transactions. The type of study suggested in the balanced-budget approach to particular taxes or expenditure programs has often been called 'local' fiscal incidence analysis to contrast it with 'global' fiscal incidence analysis in which the whole of the government sector is considered.(7)

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6 It is not strictly necessary that the two expenditure programs being compared cost the same dollar amounts. The operative principle in differential incidence analysis is that the cost of each of the two programs be such as to maintain the same level of aggregate demand.

7 Stuart and Blair (1971) have studied the Medicaid and Medicare programs in United States in terms of a local fiscal incidence analysis.

If one is concerned only with the distribution of the benefits of the medical insurance program by family income class, or by some other grouping of the population, all three types of incidence analysis will yield the same numerical results. The difference between them is in how their results may be interpreted. Specific incidence estimates imply that one can calculate the extent to which various groups will be worse off if the expenditure program were eliminated, ceteris paribus. On the other hand 'the differential incidence approach really emphasizes that this interpretation is not conceptually valid' (de Wulf, 1974, 37). It is not sensible to assume that certain expenditure programs may be eliminated with no change in taxes or other programs. Either the expenditure programs are replaced by others of equal cost, so that their effects also must be estimated (differential incidence), or else the effects of the reduction in taxes of an equivalent amount (balance-budget incidence) must be estimated.

A balanced-budget incidence study must ascertain who pays the taxes that finance the expenditure program under consideration. About 50 per cent of the total medical expenditures in Ontario are financed by the federal government out of general revenues; premiums cover a further 22 per cent of the expenditure, and the balance is financed by provincial general revenues.

The calculation of tax incidence by income class is not only very complex and time-consuming but also, in the opinion of some public finance economists, of highly dubious value. Recent critical surveys of the empirical literature have pointed out numerous conceptual problems (particularly those relating to tax theory) and statistical difficulties with tax incidence studies. Many of the problems seem virtually intractable.(8) Thurow (1975, 87) has said that 'the basic problem with tax incidence is that it attempts to undertake a type of analysis that is both empirically difficult and theoretically impossible'. For instance tax incidence studies

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8 For a survey of the problems see Bird and de Wulf (1973).

assume that the distribution of income before taxes would remain unaltered if the tax system did not exist. Whether such nihilism is warranted is not of great importance here. What must be made clear, however, is that the incidence analysis of this study determines the estimates of the gross benefits of public medical expenditures; it does not in any way present or imply the estimates of the net income gains (or losses) to various groups. One reason for concentrating exclusively on the benefit incidence estimates of medical insurance expenditure is that most incidence studies have hitherto devoted much greater attention to issues of tax incidence and ignored the expenditure side of the budget. It should be noted here that there is an almost total lack of such studies of Ontario's medical and hospital insurance plans, due partly to the complex methodological and analytical issues involved in conducting incidence analyses of an expenditure program. More important, such studies have been made difficult by the scarcity or inaccessibility of relevant data. Thus, one of the objectives of the present study is to suggest how the medical data available in Ontario can be exploited for the purposes of distribution studies. (The approach taken here can also be employed for an analysis of the hospital insurance program in Ontario.)

Another major issue to resolve in budget incidence studies is that of time perspective and whether a partial or general equilibrium analysis is to be attempted. Usually, partial and static analysis takes account of the most direct impacts of the public expenditure on the beneficiaries of the programs. A static but general equilibrium approach would consider the interactions that cause the redistributional impact of the public expenditure program to spread beyond the primary beneficiaries - through changes in relative prices for instance. A third approach would be more dynamic, incorporating the effects on incomes of public expenditures over time, such as through human capital formation. The analysis becomes increasingly complicated as one moves from the first to the third approach. The present empirical analysis will be static in the sense that the period will only be one year, primarily because no time-series data for the analysis are available.

Finally, it is important to distinguish between 'expenditure incidence' and 'benefit incidence' analysis of public expenditure programs. The former examines the effect of public expenditures on private incomes; the latter examines who receives the benefits of the services provided by public expenditures.

It can be argued that, in health care services, private and public expenditure patterns differ at the margin. Indeed, that is a raison d'être for in-kind expenditure programs. The demand shifts that occur when purchasing power is transferred from the private to the public sectors are likely to affect relative factor and product prices, and hence the distribution of incomes among households. 'The changes in the distribution of income resulting from marginal differences in private and public spending patterns we can call expenditure incidence' (McClure, 1974, 35).(9)

A thorough expenditure incidence analysis would involve a consideration of the following issues: the difference in public and private spending patterns at the margin, the price elasticity of demand for various goods, the extent of complementarity or substitutability of publicly and privately provided goods, the elasticities of supply of the products, differences in the propensities of various groups to consume the products, income differences between households, and finally the employment effects of the public expenditures in question. Obviously expenditure incidence analysis can be extremely complicated. That is one reason why most economists associate incidence studies of the expenditure side of the budget with benefit incidence analysis. For the present study, a benefit incidence analysis of the medical insurance program expenditures is undertaken. The analysis involves essentially two steps: first, the allocation of the services provided by the medical insurance program to the relevant beneficiaries

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9 In cost-benefit literature these changes are often called 'pecuniary externalities' and are usually ignored in the empirical analysis as they are entirely redistributional.

(i.e. users); second, placing a dollar value on these services. The methodological and statistical issues involved in the analysis will be discussed in due course.

The relationship between health care utilization or access studies on one hand, at least those that use conventional outcome indices, and incidence studies of public expenditure on the health insurance programs on the other should be apparent by now. It would be most useful to have for Ontario a utilization study relating physical quantities of medical services used by families to a number of socioeconomic and demographic factors - factors that include variables which are also relevant to incidence analysis, such as family income. Such a study would allow investigation of the incidence of public expenditures on the medical insurance program. Roughly speaking, that would be the first step in a benefit incidence analysis. Transforming the physical or real quantities of medical services into a monetary value through the use of 'prices' or 'costs' of these services would be the second step. These two steps are what the present study undertakes.

It can be argued that a utilization study as described above is a prerequisite to a meaningful benefit incidence analysis. Hitherto, budget incidence studies in Canada have usually based their analyses of public expenditure programs in the medical, hospital, drug, housing and education areas on extremely crude utilization data, as we shall see. The utilization data used are normally for groups, and very little can be inferred from them about the distributional effects of the public expenditure on the different socioeconomic groups. In this respect the present study is quite different from others. Instead of using grouped data, the incidence analysis is based on individual or family-specific medical utilization data.

Chapter 2

A review of recent Canadian studies

Before the introduction of comprehensive public medical and hospital insurance programs, many official and independent studies were carried out in an effort to discover the relationship between socioeconomic status, morbidity, and utilization of health services.(1) In general, these studies showed several very common findings, which may be summarized by two propositions: medical and hospital utilization is positively related to socioeconomic status, and socioeconomic status is inversely related to morbidity.

With the advent of public health insurance schemes, some major empirical questions arose. What would be the relationship between socioeconomic status, morbidity, and utilization of health care services if all persons regardless of economic means had equal access (zero or negligible prices) to medical and hospital services? Would the differential utilization prevalent in the years before public insurance be eliminated if the economic factor were reduced to a position of little significance? Indeed, would the poor use more health services relative to the non-poor?

There is much dispute about the answers to these questions. Referring to the British National Health Service, Richard Titmuss (1968, 196) has stated:

> 'We have learnt from 15 years' experience of the Health Service that the higher income groups know how to make better use of the services; they tend to receive more specialist attention; occupy more of the beds in better equipped and staffed hospitals; receive more elective surgery; have better maternal care; and are more likely to get psychiatric help and psychotherapy than low-income groups - particularly the unskilled.'

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1 For brief reviews of the Canadian, British, and American literature respectively, see Fraser (1968), Rein (1969), and Hyman (1970).

A more recent study also concludes that inequalities in the use of medical services persist within the National Health Service.(2) Similar views were expressed earlier by Butler and Bonham (1963) and by Abel-Smith and Townsend (1965). More recently, Townsend (1974) has presented a considerable amount of evidence in the form of mortality and morbidity statistics in support of his thesis that health status differentials between the social classes in Britain are widening, not narrowing as one might expect under the National Health Service. Hart (1971) argued that the availability of good medical care tends to vary inversely with the needs for care in the population served. The reason for this is that the best-trained and most able doctors tend to go to upper- and middle-class areas. The low-status areas, where mortality and morbidity is highest, tend to get less able and less well-trained doctors. Hart suggested too that middle-class patients demand more health services than working-class patients and tended to be more critical about the care they receive with the result that they were better served. The earliest Canadian study of the Saskatchewan universal, comprehensive, medical insurance plan similarly concluded that while all had benefited from the introduction of the plan, little change had occurred in the relationships between socioeconomic status and the utilization of health care services (Badgley et al., 1967).

On the other hand a number of studies assert the contrary. Martin Rein, reviewing published and unpublished research on social class utilization of medical and hospital care in Britain, concluded that 'the British experience suggests that the availability of universal free-on-demand, comprehensive services would appear to be a crucial factor in reducing class inequalities in the use of medical care services' (Rein, 1969, 52). He found that the lowest social classes make the greatest use of medical care services and that the care they receive appears to be of as good quality as that obtained by other

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2 An unpublished study by I. Gough, cited and summarized by Rein (1969, 44)

social classes. A study missed by Rein in his survey of the literature had similar conclusions regarding the British experience. Stewart and Enterline (1961, 1194) argued that 'economic barriers to medical care probably existed in England and Wales before the NHS. Physician utilization increased after the introduction of the NHS. Moreover, the increase was greatest among lower-income groups and among population groups not previously covered by National Health Insurance - housewives, the aged, retired and unoccupied persons'. They also found, surprisingly, a drop of about 13 per cent for males and 9 per cent for females in the medical-consultation rates for persons in the highest income class. They suggested that 'this could mean that the members of this income group found the NHS not to their liking, and were staying away from physicians' offices when they should have gone, or it might mean that before the NHS some physician visits made by this group were unnecessary' (ibid, 1191). However, Stewart and Enterline do not explain why one might expect a reduction in the unnecessary physician consultation once physician care became free of direct payments. This is all the more curious because they also state that members of this income group 'were not covered to any extent' by insurance programs before the National Health Service and 'generally made direct payment for the service they received' (ibid).

Perhaps the greatest source of scepticism about the attainment of equality in the distribution of medical services as a consequence of free universal insurance systems derives from utilization studies conducted mainly by medical sociologists. They point to a number of attitudinal and behavioural characteristics of the poor and to features of the delivery system that, many have argued, are more important in determining the utilization of care than financial variables. Some of the factors cited include lack of knowledge and education about illness symptoms, ignorance of the availability of medical services, relationships between medical personnel and patients of low socioeconomic status, the complexity and impersonality of institutions, problems of communication, the

middle-class bias of health professionals, lack of integration and co-ordination with other social service programs, as well as certain racial, ethnic, religious, and life-style characteristics.

Many have concluded that the mere removal of financial obstacles to care will not greatly affect the lower use of care by the poor. Supplementary programs directed to the poor are necessary, they believe, including a variety of social services and informational and educational programs. Furthermore, 'because of a drastic mismatch between medical organization and lower income life-styles, the extension of quality care to lower income groups requires a radical reorganization' of the health care delivery system (Strauss, 1969, 146).

So far there exists only one benefit incidence study (as defined in the previous chapter) of the medical insurance program in Canada.(3) That study deals with the medical insurance program of Saskatchewan. No distributional study exists of the medical programs for the other provinces. (Incidentally, there is no distributional study of the hospital insurance program for any of the provinces.) However, certain empirical studies, while they do not examine explicitly the income distributional effects of the health care programs, at least suggest or imply what these effects are likely to be. In the following sections a few recent studies well-known to health care researchers and policy-makers will be critically reviewed. Those selected are particularly interesting not only in their findings but also in methodology, sources of data, and assumptions. The major reason for the lack of empirical studies of the distributional effects of the Canadian medical and hospital insurance programs is undoubtedly the lack of information. But a shortage of relevant theoretical and methodological studies and a lack of interest in the subject have also contributed to its neglect. The result has been a widespread and complacent,

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3 The study by Beck and Horne (1976) may be viewed as an example of a benefit incidence analysis of medicare in Saskatchewan, the authors do not make such a claim.

but unsupported, belief that our current programs are correct or appropriate from the point of view of income distribution.

There are a few American studies of the distributional effects of health care programs such as Medicaid and Medicare.(4) Because the programs analysed in these studies are quite different in many important respects from the Canadian programs, most notably in the way they are financed and in the population groups covered (the American programs are not universal), these studies are not discussed here. However, they are interesting in their own right and useful methodologically, and references to them will be made from time to time.

THE ENTERLINE STUDY OF QUEBEC: METHODOLOGY, FINDINGS, AND CRITIQUE

Two twelve-month household surveys - before and after the introduction of medicare - by personal interview were conducted on 5,789 households in the Montreal Metropolitan Area. Completion rates were remarkably high, about 92.5 per cent in the first survey and 95.3 per cent in the second. Interviews averaging fifty minutes (long form) conducted by a commercial household survey organization achieved 85.7 per cent completion rate in the first survey and 87.5 per cent in the second. Public health nurses obtained an abbreviated interview averaging ten minutes where the first interview failed. Proxy respondents were used for all children under seventeen years of age and for absent adults. A random half of the households visited in the first survey was visited in the second survey. Information obtained in the surveys included family income; demographic characteristics of the respondents; illnesses, selected symptoms, and number of physician visits by type of visit (office, home); attitudes and opinions about service received; and convenience of access to medical services.

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4 For example, see Davis and Reynolds (1975).

Information on the number of physician visits was obtained for the two-week period preceding the interview. The results of the study are quoted in annual figures.

The major findings relevant to the distributive effects of the medicare program can be seen in Table 1. Although there was no over-all change in visits per capita, there was a redistribution of physician visits per person per year away from upper-income groups towards lower-income groups. Confirmation of the results shown in Table 1 came from an examination of some 'fairly stable measures related to income levels' (Enterline et al., 1973, 1175). Adults with Grade 12 education or less showed an 8 per cent increase in physician visits, while those with more education showed an over-all 13 per cent decrease. The English segment of the population (generally better educated and with higher incomes or wealth showed a 19 per cent decrease in physician visits, while the French segment showed no change. Ethnic minorities all showed increases in physician visits. In terms of occupational groupings, unskilled workers showed a 68 per cent increase, while executives, proprietors of large concerns, and professionals showed a 25 per cent decrease.

Information on physician visits indicates that the trends by income discussed above are not simply due to age interactions (see Table 2). For those under seventeen years of age, there was a marked decrease in visits irrespective of income class. For those 65 and over, the under-$9,000 income individuals experienced an increase in physician visits, whereas those with higher incomes experienced a decrease.

The increased physician visits by the lower-income groups is explained in the following manner. Persons in the lower-income categories had a higher frequency (by age and sex) of common but important symptoms (those considered to indicate illness or disability) both before and after medicare. The reported symptoms were relatively constant in both periods. But before medicare the proportion of those symptoms for which a doctor was seen ranged from 59 per cent in the under $3,000 group to over 70 per cent for the $15,000-and-over group.

TABLE 1: Interviews and physician visits per person per year before and after medicare according to annual family income, showing percentage change

Annual Family Income ($)	First Survey (1969-70)		Second Survey (1971-2)		Change in visits (%)
	Interviews	Visits/ person/yr	Interviews	Visits/ person/yr	
3,000	1,590	6.6	1,231	7.8	+ 18.2
3,000-4,999	2,400	5.5	1,741	6.0	+ 9.1
5,000-8,999	6,921	4.7	6,098	4.7	None
9,000-14,999	3,889	5.1	4,716	4.9	- 3.9
15,000 +	1,372	5.3	2,274	4.8	- 9.4
Unknown income	2,360	4.4	2,273	4.2	- 4.5
Totals	18,532	5.0	18,333	5.0	None

NOTE: Calculation of sampling variances indicates that the trend in percentage change in physician visits according to income is significant at the 5 per cent level

SOURCE: Enterline et al. (1973, 1177)

TABLE 2: Physician visits per person per year before and after medicare according to age and annual family income, showing percentage change

	Under $9,000			$9,000 and Over			
Age	1969-70	1971-2	Change (%)	1969-70	1971-2	Change (%)	Total Change (%)
17	4.5	4.2	-6.7	5.4	4.6	-14.8	-6.8
17-64	5.2	5.6	+7.7	4.9	4.9	None	+2.0
65 & Over	7.5	8.5	+13.3	7.8	7.1	-9.0	+5.2

NOTE: Last column includes income unknown. Calculation of sampling variances indicates that the trend in percentage change in visits according to age of persons is significant at the 5 per cent level.

SOURCE: Enterline et al. (1973, 1177)

After medicare was introduced this gradient disappeared entirely.

Availability of care was measured in terms of days waited for patient-initiated appointment to see a doctor, minutes to get from home to doctor's office, and minutes waited in doctor's office. The data show that medicare increased waiting time for an appointment from six to eleven days, with the greatest increase in the higher-income families. Waiting time in terms of days varies directly with income.(5) As expected, medicare did not affect the time to get from home to doctor's office. Time waited at the doctor's office increased by an average of four minutes, with the highest proportional increase experienced by the high-income groups, though even after medicare waiting time is markedly inversely related to income.

With regard to 'quality of care', in the opinion of 8.0 per cent of the population it had improved since medicare; 29.7 per cent thought it was worse; 46.0 per cent thought it was unchanged; and the rest had no opinion. The lower-income earners were more satisfied than the high-income groups because of the above noted changes in waiting time for appointments and at the doctor's office.

The Enterline study is open to a number of criticisms. To begin with, it covers only physician services, and the visits reported excluded hospital in-patient visits and health department clinic visits. The utilization of medical services by the poor in the pre-medicare period may therefore be underestimated. Furthermore, it is possible that the poor who had previously received care in clinics and hospitals shifted to physicians under medicare. The implied bias in the result is not merely a theoretical possibility, because such a shift in medical use was indeed found by Badgley (1967) to be the case in Saskatchewan after the introduction of medicare in 1962. Secondly, although the physician-visit information was collected with reference to the two weeks preceding the

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5 These curious results are not explained by the authors.

interview, presumably for greater reliability, the results are quoted in annual figures because the survey was twelve months in duration. A simple, straightforward aggregation was apparently made, with the possibility of seasonal biases not considered at all. The poor neighbourhood, for instance, may have been surveyed in January and February, which are high utilization months. In Appendix A, data showing a highly seasonal pattern of medical care consumption in Ontario are presented. Thirdly, the concept of family income used is not explained. Obtaining income data through surveys is always difficult and fraught with various shortcomings as we shall see. It is particularly important, therefore, to make clear what is meant by income (taxable income, net income, gross income). Fourthly, to what extent are physician visits, defined to include telephone contacts, face-to-face contacts in office, hospital out-patient and emergency room visits, home visits, and visits at schools and at work, an accurate measure of the quantity of physician care? Such visits inevitably entail quantitative and qualitative differences in services. How did medicare affect each type of physician visit? An attempt to reduce to a common denominator the varying services involved in the different physician visits, by pricing these visits on a fee schedule, would have been useful also in evaluating the effects of the medicare program.

A fifth objection to the Enterline study is that the cross-tabulations shown in Table 1 between family income and physician visits were not controlled for factors such as ethnicity, education, age, or family size. Thus it is difficult to know whether the relative composition of the respondents in the two samples by family income class were the same or different from one year to the next. By the study's own findings, these factors are important determinants of the relative use of medical services. Sixth, interview surveys are of course subject to the inaccurate recollection of the respondents. Errors on many questions are inevitable, and perhaps even more so in the case of proxy respondents. Also, many lay persons would have difficulty in understanding or

recognizing symptoms or illnesses, and this ability may be related to the socioeconomic, particularly the educational, status of the respondents. Seventh, the study found a redistribution of physician visits per person per year away from upper-income earners and towards lower-income groups. There was no net increase in physician services utilization after medicare by the population. The reasons for the decrease in utilization by the higher income groups are not offered. Presumably the opportunity costs of the increased waiting time must have been sufficiently large to outweigh the reduction in out-of-pocket costs brought about by medicare. Finally, the results in Table 2 suggest that there was not only a redistribution from the higher to the lower income groups but also from the younger (under seventeen years of age) to the older generations, particularly those over sixty-five. No explanation for this finding is offered.

The Enterline study is extremely important both inspite of and because of the shortcomings and criticisms outlined above. The study is unique in Canadian health care research, the only one that makes a formal comparison of the utilization of physician services before and after the introduction of a public medical insurance plan. Several important lessons can be extracted from it. First, collecting medical utilization data from household interview surveys is obviously surrounded with problems, the main one of course being the inaccuracy of memory. If at all possible a more reliable source of utilization data is desirable. As will be fully explained in the next chapter, a health care utilization study in Ontario can indeed be based on alternative data sources. The second major lesson actually flows from the first. In attempting to avoid the memory problem the reference period may be limited to a short time, usually two weeks, but this encounters the seasonality problem. Very little is known about the seasonal pattern of disease and morbidity and the consequent medical care utilization of socioeconomic groups. In view of this ignorance it is simply prudent to take as long a view as possible, that is, to cover the whole seasonal variation.

The third major lesson that can be drawn from Enterline's study is that physician visits ought to be fully differentiated, since visits are inevitably much different from each other both qualitatively and quantitatively.

R.G. BECK'S STUDIES OF SASKATCHEWAN: METHODOLOGY AND FINDINGS

The effects of comprehensive, universal medical insurance on the utilization of physician services by income class in Saskatchewan is the subject of four recent papers by R.G. Beck. The first (1973) and the fourth (with J.M. Horne, 1976) examine the effects of medicare on access to physician services by various income classes. The other two papers (1974a; 1974b) estimate the effects of copayments or utilization charges upon the use of physicians' services by the poor. The studies are particularly interesting because Saskatchewan was the first province in Canada to introduce medicare and to experiment with copayment as a means of controlling costs under such a program. Its longer experience provides historical data not available elsewhere.

Data for the first study were linked together from three sources. Registration files contained information on certain sociodemographic characteristics of each family, such as family size, marital status of head of family, age of family members, sex, and location of family. The medical service records had a patient history file containing all physician services received by the patient under the insurance plan. The income data for the sampled families were drawn from the individual tax returns held by the Saskatchewan Treasury Branch. A family is defined to be either a self-supporting person of any age, together with his spouse or dependents under eighteen years of age, or a single person over this age (whether self-supporting or not); this is the definition of family used by the Saskatchewan Medical Care Commission.(6) The period covered in the study

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6 It should be noted parenthetically that the definition of the family in Ontario is not the same as that in the Saskatchewan health care system. More on this point in the next chapter.

included the calendar years 1963-8. Except for the introduction of copayment charges, to be explained later, there were virtually no changes in the insurance program in this period. A random sample of forty thousand families was selected in each year. Representativeness of the samples in terms of family size and income distributions was tested and found to be satisfactory.

The definition and measurement of 'accessibility' used in the study is the proportion of families of a given economic class who have not had medical services in a given year. The advantage of 'non-use' comparison is that it allows behavioural patterns over time to be more readily observed. Moreover, the first contact is normally patient-initiated, while subsequent contacts may be physician-influenced or determined, so that non-use data allow a better answer to the question whether certain groups fail to utilize physician services even when financial barriers are removed. The main relationship considered was that between accessibility and income class over the six-year period. Families were grouped into seven income classes: no income; $1-1,499; $1,500-2,499; $2,500-4,999; $5,000-9,999; $10,000-14,999; and $15,000 plus. The medical service variables used were the whole medical care system, general practitioner services, specialist services, complete examinations, regional examinations, laboratory testing, home and emergency visits, hospital visits, major surgery, and minor surgery.

There was considerable disparity in access to physicians' services by income class in the first full year after the introduction of medicare. For example, 42 per cent or more of the lower-income classes had no contact with physicians, in contrast to 10 per cent for the highest income class. Before medicare the disparity in access would have been greater than, or at the very least equal to, the pattern exhibited in 1963. As an over-all generalization the disparity in accessibility is reduced over time, but not removed. Except for hospital visits, a clear pattern of differential levels of utilization by income class is evident for all service types. Non-use of

the medical care system appears to vary inversely with income class.

The data also indicate that while both patient-elective and physician-elective services manifest disparity in non-use by income class, the patient-elective services show relative reductions in non-use levels over the period studied, while disparities in physician-elective services show little change. Patient-elective services are thought to cover general practitioner services, complete and regional examinations, and home and emergency visits, whereas physician-elective services include lab services and minor and major surgical procedures. Reflecting on the utilization of the different types of medical services by the various income classes, Beck (1973, 353) comments that 'the interaction of the patient and the provider of services at first contact operates to exacerbate differentials among income classes in their subsequent contacts with the medical care system'. Beck also suggests that the 'quality' of care received by patients may vary by income class. The evidence implies that there has been no change in relative accessibility to specialist services by the various income classes; the rate of change has in fact been the same for all classes. Similar results were obtained for laboratory services. Disparity of non-use by income class for major surgery actually increased over time (reflecting, in part at least, the disparities in physician visits, both general and specialist).

Beck's (1974a) second paper attempted to estimate the impact of the utilization charges mentioned above on 'poor' families. The same data collection procedures as described above were used. A family was defined as poor if it used 70 per cent or more of its income for food, clothing, and shelter.(7) The analysis was limited to estimating the effect of the utilization charges during the first year after their

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7 This is the definition of poverty used by the Economic Council of Canada (1968).

introduction; no attempt was made to assess their longer-term effect. (These charges were removed in 1971, about three years after their introduction.)

The method of estimation is through a single-equation regression model in which the number of physicians' services per family per annum is regressed against family income per annum, with a time variable, categorical or dummy variables for the utilization charge, and certain sociodemographic variables such as family headed by single male or female, age of family head, size of families, rural or urban setting (population of 10,000 or more) of families. The model is additive and does not allow for interaction effects between the independent variables. That is, the effects of the utilization charges are assumed to be the same for all family sizes, all wages, and all types of families. The dependent variables used were all physicians' services, general practitioners' services, specialists' services, complete examinations, regional examinations, home and emergency services, hospital visits, laboratory services, major surgery, and minor surgery.

The major conclusion of the study is that the copayments reduced the use of physicians' services by the poor by an estimated 18 per cent in 1968. This was considerably greater than the reduction of service experienced by the entire population, estimated at 6 to 7 per cent. Analysis by type of practitioner showed a 14 per cent reduction by poor families for general practitioners' services and a 5 per cent reduction for specialists' services. The examination of the differential impact by type of service indicated that in general the poor's consumption of patient-elective services declined more than that of physician-elective services.

Beck recognizes that the coefficient for the utilization charge variable needs careful interpretation. It is a hybrid comprised of both demand and supply effects. The price effect on patients of the utilization charge is a reduction of the quantity of services demanded. But these charges may have a supply effect because the physician experiences a reduction in payment from the medical care plan. The physician is likely to

face increased costs of collection and bad debts. Furthermore, the physician may not charge his poor patients the utilization charges (fee discrimination). On the assumption that physicians have income targets and to the extent that physicians can influence demand, the physician supply response to the introduction of utilization charges may be positive. Thus the coefficient on the utilization charge variable represents a combination of a negative demand effect and a positive supply effect. However, the analysis did not decompose these effects.

The third paper (Beck, 1974b), using the same methodology and analytical approach, reinforces these conclusions for the whole of the three-year period in which copayments were in effect. 'The imposition of direct charges on the consumers of service resulted in the permanent postponement of some consumption. The long-run decrease in utilization appears to be in the order of magnitude of 16 per cent on average family use' (ibid, 18).

The significance of Beck's studies on the effect of copayments is that a uniform copayment system for all consumers will have a greater deterrence effect on the poor, thereby confirming what he found in his first study - that a (free) medicare program has increased the utilization of medical services by the poor. It also suggests that the trend towards equality of access was probably being reversed by the implementation of a copayment system.(8)

Beck's latest paper is most directly relevant to the interests of the present study. The benefits of the insurance program to families are measured in terms of the dollar value of physicians' services paid by the program on behalf of the families. It should be pointed out here that this is how benefits are defined and measured in the current study also. The relevant results of Beck's study are presented in Tables 3 and 4.

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8 The copayments were removed by the New Democratic Government of Saskatchewan in August 1971.

TABLE 3: Distribution of families by income and by dollar value of medical benefits, all services, 1967 sample data

Income class ($)	Percentage of families with dollar benefits of										Total families	Mean dollar benefit
	Zero	1 to 24	25 to 49	50 to 99	100 to 149	150 to 249	250 to 349	350 to 499	500 to 749	750 +		
1 - 2,499	25.7	29.7	14.1	12.4	6.1	6.2	2.9	1.8	0.8	0.2	6,166	$ 60.77
2,500 - 4,999	22.5	25.1	15.2	14.8	8.1	7.7	3.4	2.3	0.8	0.2	7,497	71.70
5,000 - 9,999	15.8	17.6	15.9	18.9	11.6	10.7	4.5	3.2	1.3	0.4	8,370	96.44
10,000 - 14,999	11.6	16.9	16.7	19.9	13.5	10.4	5.3	3.9	1.4	0.1	2,211	103.59
15,000 +	8.8	15.2	15.2	21.0	13.8	13.0	6.4	4.6	1.2	0.7	840	117.99
All classes	19.6	22.7	15.3	16.3	9.4	8.8	3.9	2.7	1.0	0.3	25,084	81.67

SOURCE: Sample data supplied by the Saskatchewan Hospital Services Plan, Medical Care Insurance Commission, and the Saskatchewan Treasury Department.

TABLE 4: Mean dollar value of medical benefits per family by income class for various types of services, 1967 sample data

Type of Services	$1-2,499	$2,500-4,999	$5,000-9,999	$10,000-14,999	$15,000+	All Classes
General practitioner	38.70	45.53	57.51	58.98	57.73	49.46
Specialist	22.71	26.89	40.28	44.80	60.83	33.10
Complete examination	5.62	6.31	8.43	9.55	10.15	7.25
Regional examination	14.30	17.07	22.04	23.17	23.47	18.82
Home and emergency visits	4.25	5.06	6.65	7.31	7.50	5.70
Hospital visits	7.85	7.15	6.84	6.31	5.75	7.08
Major surgery	15.76	18.67	24.93	27.28	36.13	21.44
All services	60.77	71.70	96.44	103.59	117.99	81.67

SOURCE: Compiled from Tables 2, 3, and 4 of Beck and Horne (1976, 79, 80, 81).

The most notable features of Table 3 are the following. Within each income class is a striking asymmetry in the benefits received by families, with a very much higher proportion of the families in the zero- and low-benefit categories relative to the higher-benefit categories. However, there are important differences in the configurations of medical benefit between the income classes. Thus, Table 3 indicates that the likelihood of low benefits ($0, or $1-24) decreases with income, or conversely the likelihood of higher levels of benefits increases with income. The average benefits per family by income class indicate that benefits vary directly with income and range from a low of $60.77 among families with incomes of $1-2,499 to $117.99 among families with incomes of $15,000 or more.

As can be seen in Table 4, mean benefits increase with family income for services provided by general practitioners and specialists. The same pattern prevails for distribution by type of services such as complete examinations, regional examinations, home and emergency visits, and major surgery. The only exception is hospital visits, the medical benefits of which are inversely related to family income. Beck and Horne (1976, 76) conclude that 'evidently members of poor families spend more time in a hospital (though not for major surgery) than do members of middle- or upper-income families. While there are doubtless many complex factors at play here, suffice it to say it is one of the few results in this study that is fully consistent with conventionally held notions concerning the distribution of medical need in the population'.

Beck also examined the medical benefit distribution by income class for 1963 and 1971. The results indicate that in both years the benefits were positively related to income class, as in 1967. For the sample population, mean benefits increased by 22 per cent between 1963 and 1967, though the rates of increase were not uniform across the income classes. The percentage increases were 31, 6, 17, 12, and 35 from the lowest to the highest income class. Thus the highest rates of increase were for the lowest ($1-2,499) and the highest

($15,000+) income classes. As there were no price changes during the 1963-7 period, the data reflect the increased use per family of physicians' services. In contrast, the 34 per cent increase in average benefit per family between 1967 and 1971 is due in large part to two successive fee schedule changes resulting in a price increase of approximately 28 per cent. This suggests a marked slowdown in the rate of increase in use compared to the earlier period. Furthermore, the increases across the five income classes were within a narrower range of 24 to 37 per cent.

Beck's data compilation procedures avoid the major criticisms made of Enterline's study, namely the unreliability of utilization data obtained from surveys, the problem of seasonality, and the extremely narrow concept and measurement of physician services. One criticism that can be made of Beck's analysis, however, is that he presumably did not find it necessary, or more likely did not find a way, to supplement his data sources with a more complete set of (particularly) sociodemographic data. For example, the Saskatchewan medical insurance registration files evidently did not have data on the occupation or education of the head of family or the spouse. A useful supplement to his data would have been information on distance and time to visit doctors, the average waiting time for physician appointments, and the amount of time at the physicians' office, and the lack of such information limits the type of utilization study possible.

The present analysis, as we shall see, relies on machine-readable utiliazation data similar to that employed by Beck. However, unlike Saskatchewan, Ontario does not have such data for a long period of time. In the present study a household interview survey was undertaken expressly to supplement the utilization records with a more complete set of socioeconomic and demographic data than that available to Beck.

A COMPARISON OF THE ENTERLINE AND BECK STUDIES

Among the major methodological differences between the

studies surveyed here is Enterline's use of survey data and Beck's use of 'official' data to obtain information on the families' use of physician services. Also Enterline used highly aggregated outcome indices to measure the distributional effects of medicare, without attempting to place monetary values to the services received by various income classes.

The results of the studies are remarkably different. The Enterline study depicted a reversal in the relationship between income class and medical care use within one year after the implementation of medicare. Beck's studies showed that although medicare did increase the accessibility of the medical system to the poor relative to the non-poor and the rates of accessibility were converging over time, nevertheless even five to eight years after medicare was introduced, the results still indicated a positive relationship between income class and health care use. Intuitively at least, Beck's results are more credible than Enterline's. Even the most devout advocates of free public medical insurance programs could not have expected the dramatic change in the distribution of physician services found by Enterline. We have just seen that Beck's utilization data are by far the more reliable and complete. However, the unit of analysis in Enterline's study is the individual, not the family as in Beck's, and it is extremely difficult to compare the two studies. Thus their inconsistent and contradictory findings - which is how they have been widely interpreted - may be more apparent than real.

FISCAL INCIDENCE STUDIES

Several empirical studies have examined the net fiscal incidence of the entire governmental budget, as distinct from the incidence of a single program or a limited set of them. Since the over-all fiscal incidence is an aggregation of the incidence analysis of specific revenue source and expenditure programs, it is very difficult to isolate the net fiscal incidence by income class of the health care programs only.

A major difficulty commonly faced by these studies is the

distribution of the public expenditure on hospital and/or medical programs among the various income groups. In the absence of hospital and medical care utilization data by income class or other relevant grouping of the population, recourse to rather dubious assumptions and the use of indirect evidence is unavoidable. In the hospital program, for example, to establish a distributive series by income class - a series by which the hospital program expenditure is allocated to the various income classes - hospital utilization data by age groups are transformed to yield the needed proxy distributive series. The author of the best known study (Gillespie, 1975, 117) has described the various steps involved in detail:

> The proxy series for hospital care was derived as follows: first, the patient days since admission by age for all of Canada were obtained from the Annual Report of the Department of Health and Welfare on the Operational of Agreements with the Provinces under the Hospital Insurance and Domestic Services Act for the Fiscal Year Ended March 31, 1969 ... Second, a regional breakdown of population by age groups was obtained from The Canada Year Book 1970-1 ... This provided a proportional distribution of population by age group and region. Third, the proportions derived in step two were then applied to the totals obtained in step one in order to obtain hospital use by age and region. Once the actual numbers were derived, the number of new-born babies per region (Annual Report, op. cit.) were added to the 0-4 age groups; this was necessary [to include] new-born infants. The resulting distributions are summarized ... below.
>
> It was then necessary to allocate the data on hospital use by age and region to the family money income brackets used in this study. Fourth, Income Distributions by Size in Canada ... provides the distribution of family units by age and by income bracket. Consequently it is possible to convert the distribution of patient days by age (step 3) into a distribution of patient days by age by income bracket, given the assumption that hospital care use for a given age group is randomly distributed by income bracket. The distributions were then summed across all age groups to generate the series, patient days, by income bracket, for Canada, our proxy series for hospital care. The fifth step involves calculating the regional equivalents of the All-Canada series. The resulting distributive series are summarized [below] ...

The two tables constructed by Gillespie are reproduced here (Tables 5 and 6). While Gillespie was able to generate a proxy series for hospital care based on patient days, he was unable to find a useful measure of total use of physicians' services by age group or by region, much less by income class. He thus employed the same proxy series for medicare services as for hospital care services.

Johnson, whose fiscal incidence study for the province of Ontario (1968) was for the year 1961, prior to the introduction of medicare and just after the full implementation of the hospital insurance program, recognized that it

> is difficult to allocate these expenditures to families because there are no available data relating hospital care to income. We have assumed that there is no relationship between hospital care and income and that each individual in the province receives equal benefit from these expenditures. Thus, these expenditures are distributed according to the number of individuals in each income class. In addition to some imperfections in our percentage frequency distribution, there exists the possibility that low income individuals are hospitalized for greater periods than high income individuals because of inferior diets and because medical care is not utilized in the early stages of illnesses. To the extent that this is true, all results understate the progressivity of these hospital expenditures.(53)

The present study is intended not merely to be a utilization study but also to find the effects on income distribution of public expenditure on medical insurance in Ontario. Through two examples we have seen how incidence analysis of public health insurance programs has been carried out hitherto, employing only grouped utilization data and hence forced into very crude assumptions. The current study by contrast has access to micro-data, i.e. medical utilization data on specific individuals or families, a much firmer basis for an incidence study.

TABLE 5: Patient days since admission, by age group and region, Canada 1969

Region	Age group				Total	Distribution by region(%)
	Under 24	24 - 44	45 - 64	Over 64		
Canada	11,238,051	7,233,644	9,153,307	12,516,760	40,141,762	100.0
Maritimes	1,202,769	612,690	865,073	1,289,226	3,969,758	9.9
Quebec	3,290,539	2,140,434	2,483,392	2,861,332	10,775,697	26.8
Ontario	3,821,666	2,629,430	3,295,756	4,619,936	14,366,788	35.8
Prairies	1,923,192	1,172,574	1,573,030	2,293,070	6,961,866	17.3
British Columbia	999,885	678,516	936,056	1,453,196	4,067,653	10.1

SOURCE: The Annual Report of the Department of Health and Welfare on the Operation of Agreements with the Provinces Under the Hospital Insurance and Diagnostic Services Act for the Fiscal Year Ended March 31, 1969, Queen's Printer, (Ottawa, 1970), p.100; and The Canada Year Book (1970-1971), D.B.S., Information Canada, (Ottawa, 1971), p.235. Gillespie (1975, Table B4)

TABLE 6: Relative hospital (and medical) use, by region and income class, Canada 1969 (%)

Region	Family money income class									
	Under $2,000	$2,000 -2,999	$3,000 -3,999	$4,000 -4,999	$5,000 -5,999	$6,000 -6,999	$7,000 -9,999	$10,000 -14,999	$15,000 and over	Total
Atlantic region	15.3	10.7	9.8	8.8	9.2	8.1	18.9	13.5	5.8	100.0
Quebec	13.9	9.1	8.3	8.1	8.5	8.4	21.0	15.6	7.1	100.0
Ontario	15.4	9.7	8.1	7.2	7.7	7.3	20.4	16.6	7.9	100.0
Prairie region	15.1	9.9	9.8	7.8	8.2	7.7	19.3	15.3	7.0	100.0
British Columbia	16.0	10.4	8.4	7.5	7.2	7.0	20.5	16.1	7.2	100.0
Canada	14.8	10.2	8.4	7.8	8.1	7.8	20.4	15.9	7.3	100.0

SOURCE: Gillespie (1975, Table B5)

Chapter 3

Data and problems in concept and method

ESTABLISHING THE DATA BASE

The data for any utilization study should permit one to examine who uses what. However, we have seen that studies vary considerably in their use of variables to satisfy these two broad data requirements. The two most important aspects of 'who' are defining the appropriate consuming unit and describing the unit by those sociodemographic and economic characteristics which may determine the extent and type of health care utilization. The preceding chapters also suggest that the 'what' should be services used by the consuming unit in both real and monetary terms.

From the Enterline study of Quebec's experience with public medical insurance we saw that medical utilization data should attempt to cover a continuous period that is sufficiently long for the results of the analysis to be reasonably valid. The seasonal pattern of medical utilization in Ontario (see appendix A) suggested that the period be one year, which precludes the effective use of a household survey for information because respondents' memories cannot be trusted over that length of time. But surveys suffer from other weaknesses too:

Non-response or bias results from ignorance, misunderstanding, or reticence on the part of the respondent, from the interviewer's own point of view, and from the design of the questions.

Utilization data obtained by survey are typically expressed in aggregative or general terms, such as physician visits or encounters.

For the purpose of this study the monetary value of these real services is also necessary; but in an insurance system where patients generally do not pay

for services received, such information cannot be gained from interviews.

Last, but not least, a survey is lengthy and very expensive.

The main sources of medical utilization data on specific individuals or families are the statistical files on physicians' claims records kept by Ontario Health Services Plan (OHIP).(1) Physicians fill out a claim card for each patient treated, giving details of the services provided, the fees chargeable under the Ontario Medical Association fee schedule, and basic identification (age/sex) of the patient. Each claim card has an OHIP number that covers an OHIP 'family' (to be defined and discussed later) to which the individual belongs. Each card is individually checked (i.e. valid OHIP number, correct fees, etc.) and coded; the particulars are transferred to computer tapes. Every month the system handles about five to six million claim cards.

This OHIP file allows a number of immediately apparent improvements over the survey vehicle. In particular, the data are more reliable (not being dependent on human memory), detailed services and patient-specific records are accessible, and cost data are included. But there are two major problems in using OHIP medical data. First, and most important, OHIP medical files do not have all the data required for the study. For example, the files do not have data on family size (they register only those who receive services), nor the data on family income (without which an incidence study is not possible), education and occupation of the head of the family

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1 Of course other sources of utilization data are the records held by hospitals and doctors. Indeed, the information that OHIP accumulates derives from such records. However, it is practically impossible to collect information on the patient's use of services from such records. The facts that individuals receive care from more that one physician and/or hospital, members of the family use different physicians and/or hospitals, and finally medical ethics and regulations govern the dissemination of utilization data effectively eliminate these sources of information from consideration.

or spouse, and other relevant socioeconomic variables. Basically, OHIP data identify the beneficiary unit only by the OHIP insurance number and the age and sex of the patient. The second problem, a technical matter of retrieval, is that the utilization information from the OHIP files is readily accessible only via the OHIP insurance numbers. Thus, while the OHIP records are the best utilization data available, they are still grossly incomplete. Almost all the socioeconomic and demographic information on individuals and families necessary for a utilization and incidence study must be found elsewhere and combined with the OHIP data to complete the required data base. A household interview survey was therefore undertaken in which socioeconomic and demographic information was gathered, along with the family OHIP numbers. The OHIP number, unique to a family, was the instrument by which the survey information was matched (merged) with the OHIP medical records held by the Ministry of Health of Ontario.

The questionnaire used for the household interview survey is presented in appendix C, together with brief notes on questions that needed some explanation. The survey does not elicit the sample families' responses to establish their utilization of medical care. Rather, it concentrates on the sociodemographic and economic data lacking in the existing OHIP medical files. Thus respondents are asked to provide information on the age, marital status, and sex of each family member; the educational, occupational, and employment status of the family head and the spouse; the gross income of the family head and spouse and the total family income. Several questions were designed to elicit information on the distance, travel time, and waiting time experienced by the respondents in obtaining medical care, because previous studies indicated that these may be important determinants of medical care utilization. A series of questions attempted to establish the extent and amount of the average indirect monetary costs incurred by the respondents in obtaining physician services (for example, costs of transportation, prescription drugs, babysitting, etc.) Several other questions in the survey were

not directly relevant to the requirements of the present study but were included in the questionnaire for the benefit of the Ministry of Health.

For technical and budgetary reasons the survey cannot fill all the information gaps. It would be useful to have information on the 'need' for health care services of the individuals in the sample and to know something about respondents' attitudes to and knowledge of the health care system. But these complex matters, requiring much survey time and expertise and hence money, could not be included in the questionnaire. An important determinant of a family's medical care utilization is the availability of health care resources, that is, physicians and hospital beds, in its area. Instead of a formal question in the household survey on the availability of health care resources, an index was incorporated into the basic sample design from available physician and hospital bed data because it was thought that many families were unlikely to be well informed about this matter.

At this point a discussion of the most important aspects of the sample design is appropriate (a more extensive and detailed presentation can be found in appendix D). A stratified cluster sample of Ontario families was employed, the population being stratified in terms of two major variables as follows. As in most incidence studies the population was divided into income classes, a classification of obvious merit when a major purpose is to discover the quantity, value, and pattern of consumption of medical and hospital care services by people in different socioeconomic classes. Details of the income stratification process, too involved to be described here, will be found in appendix D. Another stratification, also dictated by current policy concerns, divided the population into three broad geographic classifications corresponding to three 'availability of medical and hospital resources' areas: over- or excess-supplied, normally or adequately supplied, and inadequately supplied. The reason for this is that, as shown by a number of studies, the availability of health care resources is an important determinant of the utilization of physician

services (Roemer, 1961). One way to control for and examine the possible variation in the utilization of health care services due to supply factors is to stratify the sample according to some criteria of physician and hospital bed availability. Again, the data and procedures employed in this excercise, and the results obtained, are described in detail in appendix D. The time chosen for the study was the twelve-month period from 1 April 1974 to 31 March 1975.

CONCEPTUAL, METHODOLOGICAL, AND ANALYTICAL PROBLEMS

The two most basic empirical problems in benefit incidence analysis are, first, the allocation or distribution of the quantities of services rendered by the particular public expenditure programs to recipient individuals and/or families and, second, the value of these services, hereafter called the problem of benefit valuation.

In most incidence studies the allocation of the services of public expenditure programs to the various income groups is made according to some assumptions about their relative consumption of these services.(2) This is particularly true of general expenditures, that is, programs that provide public goods, such as national defence, available in equal amounts to all individuals. It is often true also of specific expenditures, that is, programs benefitting readily identifiable groups; for example, estimates of educational expenditure allocation may be made on the basis of school-age children in families. In the present study, however, more direct evidence is available. The merged OHIP-survey data set allows a straightforward identification of the individuals and their families receiving medical services.

In this analysis the terms 'recipients' and 'beneficiaries' will be used equivalently for technical reasons. It

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2 See Franzen et al. (1975) for a recent example. Note particularly how public expenditures on health and education are distributed to the different income groups.

is reasonable to regard the recipients, i.e. the consumers of medical services, as the primary beneficiaries of these services. But it could be argued, on the basis of the interdependence of utility functions or more specifically the issue of taxpayer preferences (as discussed in chapter 1), that they are not the only beneficiaries. Non-recipients of services, in theory at least, may benefit from the medical expenditures consumed by others. Technically, one way to incorporate these elements into an empirical study is to allocate only a proportion of the full benefits of the services to the recipients. The remainder can then be allocated to the other presumed beneficiaries. The conceptual and statistical difficulties in first estimating this remainder and then allocating a public good, or what has many of the characteristics of a public good, are enormous. The task, for all intents and purposes, is impossible. Thus the full value of the benefits of the services will be allocated to the recipients of the services.

Ideally, 'outputs' of the medical program are what should be valued in the current study. Since the ultimate objective of the health care services is to maintain, restore, or improve the health status of individuals, the output measures should be concerned with these things. However, 'in the literature of medical care, and of hospitals in particular, the definition of output is not only unclear, diverse, conflicting, tautological and ephemeral, but according to Fuchs, there is yet no agreement as to what, in principle, should be measured' (Berki, 1972, 32). In the face of the notorious difficulties of devising operational measures of health outputs,(3) many researchers have opted for various proxy measures. The use of the services provided by the health care system is one practical solution to the problem, although it has unavoidable limitations: for instance, services which may be 'unnecessary'

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3 There is an extensive, mainly theoretical, literature on health output measures. For a brief overview of the problems and issues involved see Lerner, Torrance, Gentry, and Mathews (1973).

or wrong from a medical viewpoint - a tonsillectomy being performed instead of a hernia repair - would still be considered outputs under this approach.

Since there is an almost total lack of a market system for insured medical services there is no ready-made vector of market prices with which to value them. A common solution to this problem in incidence studies has been to use the cost of producing these services as a measure of their benefits (Prest, 1968). While the benefit valuation problem is thus somewhat simplified, it is by no means solved. In the case of hospital services, even reasonable cost estimates are not available, because of complex problems in defining and measuring hospital outputs and the related production processes, i.e. the quantities and combination of the various inputs from which outputs derive. The only measure readily available is the hospital's per diem costs.

Although the average cost per patient day is easily computed and generally accepted, under close examination it seems a gross and unrealistic measure. It covers only one aspect of hospital outputs, namely in-patient care, ignoring out-patient care, research, education, and community services. Hospital accounting in Ontario is such that the share of total costs attributable to a particular activity of the hospital is difficult to determine. The per diem rates of hospitals that produce considerable educational, out-patient, research, and community services would be overstated relative to those that did very little in these areas. What's more, even if cost data could be related only to in-patient care, the patient-day is a far from homogeneous concept. Several studies have concluded that the considerable variation in case-mix between hospitals is a significant determinant of interhospital differences in cost per day and cost per case (Evans and Walker, 1972), as in the age and sex pattern of discharges. Better measures of hospital benefits than average cost per patient-day must be established before a meaningful hospital benefit incidence analysis can be undertaken. Unfortunately, such measures could not be established for the current study, mainly because of the

lack of diagnostic information. As a result, this study is restricted to medical utilization.

The problem of benefit valuation is much simpler in the case of medical services. All doctors are paid by the government at the rate of 90 per cent of the fee agreed to by the Ontario Medical Association and the provincial government for each of the medically necessary services covered under medicare (about 3,400 are listed in the schedule). The majority of doctors bill OHIP directly rather than the patient. These 'opted-in' physicians accept the 90 per cent payment of fees as full payment for services rendered. The 'opted-out' physicians, approximately 12 per cent of the total active practising physician population, bill their patients directly. They are allowed to charge more than the standard OMA fee for their services, provided that patients are given prior notification, but OHIP will reimburse the patient for only 90 per cent of the standard OMA fee. The measure of benefits adopted here for the valuation exercise is what is called the 'public cost' of each service - that is, 90 per cent of the OMA schedule of fees. This must be distinguished from both the level of the schedule's fees and the total price in the case of opted-out physicians. The latter figure may involve private costs to the patients.

Some more general arguments support the use of public cost as the measure of medical benefits. The current health care financing system can be said to involve a subsidy for the individual's demand for services. Subsidies and transfer payments are often treated as negative personal taxes in incidence studies (McLure, 1974). Abstracting from taxpayer benefits and externalities and given that average costs of providing specific services are constant(4) and provision of

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4 If average costs are constant, marginal costs are equal to average costs. Only then can the equality of the marginal costs to marginal benefits required for Pareto optimality lead to total costs being equal to total benefits being allocated to individuals and families.

services is efficient,(5) it can be assumed that at the margin the subsidy is worth to the recipient what it cost the government. It is difficult to examine here how valid these assumptions are, particularly with the latter assumption, since by and large the political process of decision-making as well as the power of certain health care suppliers such as physicians and hospitals are what determine the over-all resource allocation between the health and non-health sectors.

Another argument supporting the adopted measure of benefits is the following. The fee schedule represents, or at least approximates, market prices. While the fees are not determined between the true interplay of physician supply and patient demand preferences, it may be that the Ontario Medical Association, representing the physician as a group, and the government, representing the consuming public, approximate the market outcome through bilateral monopoly. Whether this is an accurate view of the fee schedule negotiation process, and how good an approximation to a market-determined final outcome this is, remain difficult questions.

The benefit valuation procedure implicitly assumes that the recipient of the services would purchase the particular package of services at these prices if he were given the money equivalent of the estimated benefit to do so. However, the very existence of the subsidy encourages the consumption of these services. Indeed, this is the raison d'être for the preference for in-kind benefit programs, deriving from the conflicts between consumer-sovereignty and taxpayer-sovereignty discussed in chapter 1. Another problem is 'benefit snatching,' particularly for low-income persons for whom the free public provision of services simply replaces the assistance they would have received from price-discriminating physicians or other private sources.

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5 'Efficient' in the sense that resources are allocated efficiently between the health and non-health sectors. If the activity in question is overextended, marginal costs will exceed marginal benefits. The excess of costs over benefits is a waste - a welfare loss - and should not be allocated as benefits to recipients.

It could be argued that government expenditure on at least some medical (and hospital) services could be construed as investment in human capital (Spratt, 1975), thus affecting the distribution of private incomes in the future. Only the consumption expenditure is correctly allocated to individuals or families during the period in which they are incurred.(6) This feature of health care services, while admittedly valid, is extremely difficult to incorporate in the current empirical analysis. First, it is very difficult to identify which of the many services or components of services one would regard as investment. Secondly, there are the inevitable problems in computing the present value of the prospective services to be imputed to their beneficiaries. These include, among others, decisions on the time horizon of the investment, the returns of the investment (it may be a good or a bad investment), and the discount rate. For an illustration of the various issues involved one need only consider how the same (investment) service would be treated if in one instance the recipient was a young man and in another a retired individual.

Methods of benefit valuation other than the one adopted here are extremely difficult and largely unexplored. For example, an objective or independent measure of value could be used, such as the loss of work prevented, but that measure would be too gross for the valuation of the many services considered here. Under what has been called the 'behavioural' approach (de Wulf, 1974), the values of services provided by the public sector are judged by the beneficiaries, presumably through a survey questionnaire. One procedure is, as a first

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6 It should be noted that the problem discussed here, namely that some health services or components thereof should properly be viewed as investment goods and hence, their current costs should be accordingly adjusted, is not the same as saying that the current analysis is static (i.e. covering one time period). Even in a static analysis the valuation exercise could conceivably incorporate the investment aspects of the expenditure program being examined. Alternatively, even in a dynamic analysis it might be difficult or impractical to account for the investment aspects of public expenditure in the valuation exercise

approximation, to regard the public cost of services as the value of these services to their recipients. The first approximation is then to be adjusted for the subjective valuation of these services by the beneficiaries. This is highly impractical, given the many hundreds of medical services under consideration. Moreover, consumer ignorance and uncertainties about the value of even the more commonly known services cast doubts on this approach.

For us to take the benefit to the consumer of medical care services as equal to their cost to the government thus requires a number of heroic assumptions. This is not to say that the measure adopted here has no meaning, merely that its deficiencies should be noted. Of all approaches to benefit valuation, the alternative adopted in this study is certainly the most practical.

The results of a benefit incidence study vary in relation to the particular income concept and measure used in the analysis. That is, one may very well find a different pattern of incidence with gross income before exemptions, deductions, and taxation than with alternative measures of income, such as disposable income or taxable income. Furthermore, alternative income concepts could influence the results of the incidence study. Income may be defined narrowly as earned income or more comprehensively to include incomes in kind, transfer incomes such as family allowances and social assistance, income from various assets, and so on. However, the data are too limited to allow us to examine how sensitive the results of the current analysis might be to different measures and concepts of income.

There are several problems with collecting income data through household interview. First, single-year survey data often contain individuals or families whose incomes are temporarily low or high, and current income positions being affected by many transitory factors. Thus it is quite possible for persons to be placed in a different income class from that determined on the basis of 'permanent income'. In the absence of panel or longitudinal surveys this deficiency is difficult to correct.

A particularly important case of the problems discussed above is the existence of a positive relationship between poor health and consequent low earnings. A number of American studies have shown that the impact of poor health on income can be large (Luft, 1975). Income loss can result from the effects of poor health on all the components of earnings: labour force participation, weeks worked per year, hours worked per week, and earnings per hour. Also, there is a differential effect of poor health in terms of socioeconomic characteristics of the sick or disabled.

Those individuals or families reporting significant short-run fluctuations in income could have been eliminated, but this was not done, because in the recent inflationary period it is not at all clear what 'significant fluctuations' would mean. Furthermore, such a procedure requires that the respondent understand what is asked, that the interviewer correctly communicate the issue, and that the respondents remember recent incomes. It could happen that an individual's current annual income does reflect permanent income, even though significantly different from last year's. The mere observation that income fluctuates does not help one decide whether or not current income is transitory. Secondly, the specific questions of the survey (numbers 11a, 11b, 11c, of the questionnaire in appendix C) ask for total income, defined to be all income before taxes and deductions of the registrant, spouse, and all OHIP family members. A detailed interview income questionnaire such as that used by Statistics Canada for the Survey of Consumer Finance was not used, because of survey time limitations. With the survey concentrated in May and the first two weeks of June, it was hoped that respondents would be more likely to remember gross income because they would have filed their income tax returns only a month or so earlier.

As in most incidence studies, the choice of the relevant population unit of analysis depends upon data, policy, and procedural considerations. Administratively, the definition of the family unit for health insurance purposes in Ontario is husband, wife, and unmarried children under 21 not working on a full-time basis. Thus, all married persons of any age, single

persons over 21, and full-time working single persons under 21 are to be regarded as separate 'family units'. Each of these families would have a registrant in whose name the insurance contract and OHIP number is registered. All members of the family are then covered by a single OHIP number. Since the information system is based on this number, a study using an economic or census definition of the family would involve numerous complications. These definitions of the family would require joining OHIP numbers, for instance. For a family to be eligible for the survey it had to have the same OHIP number effective over the twelve months of the study period. Also, since the family unit may not have been stable over this period, data on changes in family size and composition were collected.

In addition, from a policy standpoint the family or the individual may be the appropriate unit of analysis for the present study. While it is literally true that the individual is the beneficiary of medical services received, the externalities to the rest of the family members are obvious. Thus from a financial point of view the family benefits from not having to pay for medical bills for their dependents.(7)

This chapter has described the data base (and certain conceptual problems relating to it) which is employed in subsequent chapters. It was shown that the OHIP medical services utilization files allow significant improvements over survey-derived utilization information. But the OHIP files lack certain desirable family-characteristic information, and this was collected through a household survey. The following two chapters analyse these two data sets.

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7 The importance of the definition of the family can be shown as follows. If the OHIP family unit of analysis is broadened to include other 'family' members, say on the basis of an economic or census definition of the family, the distribution of the benefits could alter appreciably, at least for some groups (for example, those young OHIP families with parents over 65 years of age). This is not to say that from a policy standpoint the OHIP definition of the family is unsatisfactory. It may be that public policy would regard aged parents (for health-cost purposes at least) as independent of the rest of their family.

Chapter 4

Benefit incidence and utilization results

Two main empirical conclusions result from the theoretical discussion in the previous chapter. The first is, as McLure (1974, 50) concluded,

> It would appear that the estimation of benefit incidence is relatively straightforward statistical exercise, so far as benefits of specific expenditures are concerned, given the three assumptions mentioned above (constant costs, Pareto-optimality and no technological externalities). One need only have reasonable indicators of the participation of various groups in the activity conveying the benefits, so that the benefits can be allocated to the groups. Ingenuity in the use of scarce data is often essential, but the conceptual issues seem clear-cut.

One may wonder just what would constitute 'reasonable indicators' for a benefit incidence analysis of specific expenditure programs. This question brings us to the second major empirical conclusion: the accuracy with which the benefits are allocated to the appropriate groups is primarily dependent on the quality of the data available. The major dimensions of the quality of the data are the continuous time period covered, reliability, completeness and disaggregation and, perhaps most important, the precision in identifying the beneficiary population units. Ultimately, the quality of the data must be judged by the conclusions they allow.

STATISTICAL ANALYSIS

The central objective is to relate quantities of medical services and their value to the appropriately defined beneficiary population units. The approach taken in this chapter is one of cross-classification - the approach taken by Beck and Enterline in their studies (reviewed in chapter 2) and the conventional one in budget incidence studies. The meaning and limitations of this method will be discussed in the next chapter.

It has already been suggested that from an economic point of view the (OHIP) family is of prime interest as the unit of analysis. However, estimates are also presented on a per person per family basis. There are several reasons for doing so. First, the average OHIP family size varies considerably by the stratum it belongs to, defined in terms of the quantities of medical and hospital resources available in various locations in Ontario. Thus, the average OHIP family size in the inadequate supply stratum was 3.45 persons, as compared to 2.94 persons in the adequate supply stratum and 2.41 persons in the excess supply stratum. Secondly, the average OHIP family size also varies significantly by family income class. The average family size appears to increase with income class, the figures being 1.49 persons for the $0-3,99 income class, 1.98 persons at $4,000-7,999, 2.68 persons at $9,000-13,999, 3.45 at $14,000-19,999, and 3.0 persons at $20,000 and over. Thirdly, it would be interesting to compare the results of the present study with those established for Quebec by Enterline. It will be recalled that his results were presented on a per person rather than on a per family basis. One way to standardize for the differences in the OHIP family size is to divide the various estimates for the family by the number of persons in it, thus establishing the per person per family estimates.(1) It will be apparent from the tables presented in this chapter that the benefit incidence estimates on a family basis, as compared with those on a per person per family basis, can be remarkably different.

As explained in appendix D, the sample established by the household survey is not self-weighting. The assumption of equal probability of selection of each OHIP family in the province was deliberately contravened. Thus each observation

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1 The results could not be presented on a strictly per person basis. The two microdata files compiled for the study could not be merged person by person because of technical difficulties. The estimates made on the two bases need not be the same, but they are expected to be much alike.

of the sample cannot be given an equal weight in the analysis. The sample is not representative of the population(2) because the OHIP families in the high and low income classes were oversampled and those between were undersampled. Similarly, a larger-than-representative number of OHIP families were selected in areas considered to have an inadequate availability of health care resources.(3) It is thus necessary to assign a weight to each OHIP family to decrease the over-all representation of oversampled families and increase the representation of those undersampled. As discussed in appendix D, other reasons for assigning a weight to each family include unequal selection rates in the different strata and substrata, household non-response, and OHIP family non-response. In the calculations of the average utilization or benefits of medical services by the various groups, it is the weighted sample that must be used.

There are two important concerns in the analysis. The first is simply to quantify the health care utilization and benefits (the dependent variables) in terms of a number of population characteristics (the independent variables). The second is to examine the results for the existence of a relationship between them.(4) Several statistical techniques are useful in investigating a relationship between the dependent and independent variables that have several values (for example, the six income classes used in this study). Central to all of them is, of course, the variance among the several class or cell means. The technique of evaluating significant relationships adopted here is the analysis of variance.

2 Beck examined his sample to see how representative it was of the Saskatchewan population. The Enterline study gives no indication of having considered this issue at all.

3 The main reason for disproportionate sampling is to reduce the risk of bias if a very small number of observations in certain cells of the sample are called for on the basis of a proportional or representative sample.

4 As mentioned earlier, in many incidence studies of expenditure programs, a relationship is not discovered but simply assumed to exist. Having made the assumption, the quantification (i.e. the allocation exercise) is carried out subsequently.

In the tables found in this chapter and in appendix B the F-statistic is the value of the F-ratio derived from the analysis of variance.(5) The two degrees of freedom - among and within - are given, and the significance levels are based on a two-tailed test. The analysis-of-variance method to test for significance assumes that the data are both normally distributed within the various classes and homoscedastic, that is, variance tends to be the same in all classes. Fortunately, however, the technique is generally considered to be sufficiently 'robust' or 'rugged' to provide a useful approximation even for wide departures from both normality and homoscedasticity (Suits, 1963).

BENEFIT INCIDENCE RESULTS OF THE MEDICAL INSURANCE PROGRAM

The information is in the form of physician claims made to OHIP for services given to patients covered under the program. The claims are based on the Ontario Medical Association's Schedule of Fees, May 1974, which lists and codes approximately 3,400 services. In order to simplify the results and for reasons of confidentiality the various components of the information must be aggregated. The grouping of the particular services is suggested in the fee schedule itself. As well, advice was given by physicians employed by the Ministry of Health.

5 The cross-tabulations and the analysis of variance test for significance yield identical results derivable from a regression (using weighted data of course) of the general form $X = A+bY_i$. The variable X may be any of the dependent variables specified in the tables of the chapter. The variable Y_i can be all but one of the values of the independent variables. For example, if Y represents income class, only five classes may be specified. The constant A will then represent the average value of the dependent variable for the missing income class. The constant plus the coefficients on the Y variables will thus be the estimates for each income class. The regression will also have an F-statistic for two degrees of freedom. The estimates of X by income class, the F-statistics, and the degrees of freedom in the two approaches are exactly the same. For an explanation of the connection between analysis of variance and regression see Goldberger (1964).

The information can be broken down into the type of service given, the provider of that service, the location, and the cost. Appendix E provides a detailed itemization of the nature and content of the various categories of services and physicians encountered. It also provides an explanation of how the medical claim data were grouped together to yield aggregated data. The medical services are grouped into seven categories as follows: minor surgery; major surgery; x-rays, labs, and nuclear medicine; diagnostic and therapeutic procedures; obstetrics-gynecology and birth services; visits; and practitioner services. Physicians are divided between primary care and specialists. Primary care physicians include not only general practitioners but pediatricians, internists, and gynecologist-obstetricians as well, all other physicians being deemed specialists. The classification can be determined by the specialist code from the claims records.

There are seven different locations of interest: office, out-patient department, hospital, clinic, home, emergency department, and other institutions. The appropriate site of service is occasionally determined indirectly through the fee code prefix, the type of clinic (hospital association, departmental, other), or the presence of a hospital number.

As discussed above, only the public cost of the medical service is of interest for the purposes of the incidence study, and it is defined simply as 90 per cent of the OMA fee listed in the schedule for each service.

The results of the statistical analysis concerning the medical insurance plan are presented in Tables 7 to 18 and appendix Tables B2 to B8. The abbreviations used are as follows: Enc stands for physician encounters; Lab for laboratory X-ray, radiological, and other services; DTP for diagnostic and theraupeutic procedures; Birth for birth and gynecological services; Min. Surg. or Min. S. for minor surgery; Maj. Surg. or Maj. S. for major surgery; PC for public cost (as defined in this chapter); Prim for services rendered by primary physicians: and Spec for services rendered by specialists and practitioners (as defined in appendix E). The following

conventions are adopted as well: PC, Min. Sur. (with a comma after PC) means the total public cost for all minor surgery services; PC/Min. Surg. (with a solidus after PC) means public cost per minor surgery service.

INCIDENCE AND UTILIZATION RESULTS

The order in which the many tables presented in this chapter appear follows roughly the order of interest of public finance economists concerned mainly with benefit incidence. These interests run parallel to the interest of health care researchers principally interested in utilization results. Thus the table depicting the distribution of medical services and benefits by family income class is presented first, followed by tables showing the distribution in terms of the age and income class of the beneficiaries. Subsequently, the medical benefits and utilization by family size are presented. Later the distribution of medical benefits by family location, i.e. the residence of the family in terms of the three care resources supply strata, are provided. These are followed by the distribution of medical services in terms of the site of service received (for example, hospital, doctor's office, emergency, out-patient, etc.) by families in the different income classes. Finally, two tables show the distribution of benefits in terms of two indicators of the socioeconomic status of the family, indicators used as alternatives to the family income variable in some studies.

Table 7 shows signficant differences in the benefits received by OHIP families when they are grouped by family income class. Average medical costs per family range from a low of $145 for families in the $4,000-7,999 income class to over $250 for families in $14,000-and-over income classes. (It will be recalled that the cost of medical services is regarded as the value of the services to the recipient family in this analysis.) This difference is also apparent in most of the components or categories of the medical services, physician visits, laboratory and X-ray services, minor surgery, and major

TABLE 7: Average utilization and costs of medical services per family by income class

Items	$0 - 3,999	$4,000 -7,999	$8,000 -13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Encounters	15.71	13.31	17.07	22.27	21.68	24.01	7.68*
Services	17.59	16.11	20.20	26.33	24.96	28.56	7.63*
Visits	12.49	9.44	10.94	14.28	13.47	14.97	4.03
Lab.	3.38	4.37	4.95	6.66	5.92	7.74	5.31*
DTP	0.66	0.82	2.37	1.82	2.61	3.59	3.98*
Birth	0.01	0.05	0.13	0.12	0.07	0.05	1.90
Min. Surg.	0.22	0.33	0.66	0.76	0.91	0.69	9.61*
Maj. Surg.	0.14	0.11	0.13	0.20	0.24	0.27	3.39*
Other	0.51	0.84	0.69	2.17	1.52	1.10	7.12*
Costs ($)							
PC, Visits	85.04	71.25	89.45	121.87	126.22	167.40	6.81*
PC, Lab	26.87	23.39	36.03	43.84	41.61	60.27	7.27*
PC, DTP	3.10	6.75	16.73	7.74	8.61	14.32	1.12
PC, Birth	0.64	4.05	12.97	8.74	3.69	5.53	2.71+

TABLE 7 (Continued)

Items	$0 - 3,999	$4,000 -7,999	$8,000 -13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
PC, Mins. S.	8.93	8.40	14.84	19.31	17.99	14.27	4.15*
PC, Maj. S.	29.74	25.95	19.08	40.49	44.34	52.66	3.54*
PC, Other	5.00	6.14	7.50	15.02	11.24	8.19	7.10*
PC	159.31	145.93	202.07	257.01	253.69	322.64	8.07*
N(weighted)	125	184	420	319	197	44	Σ=1,287
N(oberved)	163	160	288	275	319	85	Σ=1,290
PC/Enc	8.88	9.90	10.24	12.03	12.29	13.09	7.07*
PC/Service	8.23	8.51	8.82	10.50	10.75	11.65	6.08*
PC/Visit	6.67	7.17	7.90	8.64	8.96	10.64	14.13*
PC/Lab	6.30	4.48	6.40	6.36	6.78	6.53	2.70+
PC/Birth	0.48	3.98	6.43	3.67	2.51	2.57	2.79+
PC/Min.S.	5.03	5.46	9.42	8.92	10.64	8.61	3.11+
PC/Maj.S.	23.78	19.64	14.74	37.11	36.57	51.05	6.15*
PC/Other	2.54	1.99	2.40	2.89	2.89	2.04	1.09

* significance level of 0.01
\+ significance level of 0.05

NOTE: The F-statistic is derived from an analysis of variance. Degrees of freedom: between 5; within 1284. The significance levels are based on a two-tailed test. N is the number of sample families in income class.

surgery. It will be noted too that the pattern or incidence of benefit by income class is not the same for each type of medical service. For example, the middle-income group ($8,000-13,999) have relatively higher average family benefits for birth and gynecological services and diagnostic and therapeutic services than other income groups. For all other types of services, the greatest beneficiaries are either in the $14,000-19,999 or in the $20,000-and-over income classes. A few of the observed differences are, of course, relatively easy to explain. Thus the relatively low benefits for birth-related services to families in the lowest income class is no doubt due to the fact that most of the persons in this class are either single or older retired persons over sixty-five. However, it is beyond the scope of the study to explain why the apparent differences indicated in Table 7 exists for the other groups of services.

The benefit incidence results, expressed in current dollar terms, conform to the utilization results expressed in terms of physician encounters, services, and the seven categories of services presented in Table 7. These seven general categories cover a myriad of specific services varying in terms of the fees chargeable by physicians. Thus it would be interesting to discover whether there are any significant differences in the average costliness of the services consumed by various subgroups. The results in Table 7 suggest that there are. For example, the cost per service (aggregated over all components) appears to be positively related to income class, with a low of $8.23 for families in the $0-3,999 income class to a high of $10.75 for families in the $20,000-and-over income class. Similarly, cost per encounter and cost per visit are also positively related to income class. There may be significant differences in the medical problems between the various income groups, but a more plausible explanation is that the higher income groups are more likely than lower-income groups to see specialists rather than general practitioners. As seen earlier in Table 4, Beck and Horne (1976) show that for Saskatchewan the higher income groups not only enjoyed greater dollar

TABLE 8: Average utilization and costs of medical service per person per family by income class

Items	$0 - 3,999	$4,000 -7,999	$8,000 -13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Services	11.21	9.80	8.72	8.21	7.81	11.87	3.28+
Encounter	6.77	6.00	5.46	3.92	4.42	6.56	9.20*
Costs ($)							
PC, Visits	55.65	42.13	39.52	38.10	37.47	60.81	3.81*
PC, Lab	17.11	13.93	17.18	14.19	14.56	28.21	3.24+
PC, DTP	2.46	3.14	4.76	2.40	2.58	6.81	1.77
PC, Birth	0.21	3.99	3.36	2.30	1.22	1.34	1.91
PC, Min.S.	4.08	3.20	7.24	5.78	5.50	5.31	2.84+
PC, Maj.S.	15.42	12.19	9.61	12.71	14.78	27.71	2.22
PC, Other	4.04	2.84	2.46	4.91	3.67	2.69	2.80+
PC	98.96	81.42	84.12	80.39	79.78	132.89	2.86+

* significance level of 0.01
\+ significance level of 0.05

NOTE: Degrees of freedom: between 5, within 1284. The notes in Table 3 on the number of families, the F-statistic, and the test of significance apply to Table 4 as well.

benefits from the medical insurance program but also had a relatively greater proportion of these benefits through services provided by specialists; in the next chapter similar evidence for Ontario will appear. In this connection it should be noted that in Ontario specialists ordinarily have higher charges for services than general practitioners.

It was noted before that the OHIP family size seems to be correlated with family income class. Given the definition of the OHIP family this is not too surprising. The OHIP families whose head is aged over sixty-five are not likely to have unmarried and unemployed children under twenty-one. Furthermore, the survey data also revealed that such OHIP family units are likely to be in the lowest income class, which also has the highest proportion of single, unattached individuals (probably including students and single mothers for instance).

When the differences in OHIP family size are taken into account, the benefit estimates on a per person per family basis show a negative relationship to income class, with $98.96 per person in the lowest income group and $79.78 per person in the highest (Table 8). This negative relationship also holds when considering physician encounters or services; thus a person in the lowest income class receives an average 11.21 services per year, whereas someone in the highest income class receives an average of 7.81 services.

The results presented in Tables 7 and 8 illustrate the importance of specifying the population unit when studying utilization. Inconsistencies between the findings of different studies can be partly due to different definitions of the family. However, in terms of benefit incidence, while the lowest income groups do receive relatively more benefits, there is no statistically significant difference among the other income classes. The reason for the insignificant differences, despite the greater difference in the utilization of services, is presumably the different composition and costliness of the services consumed by the higher income groups.

Tables 9 and 10 present summary results of cross-tabulating the utilization of physican services and the public costs of these services associated with specific members of the OHIP family rather than with the family unit as a whole. These data are derived from Tables B1 to B8.

The utilization and benefit estimates per family and per child for those families with children are presented in Tables 9 and 10, with more detailed information in Tables B1 and B2. The results are similar in both cases, with the lowest income class children receiving more benefits than children of other income groups. On both the per family and per child basis, one observes what will be called as check-mark distribution, for services, encounters, and public cost of medical services by income class; such a distribution shows children in the lowest income group receiving the greatest benefits or as the greatest users of medical care services, while for the rest of the income scale a positive relationship exists between use (or benefits) and income class. Tables B1 and B2 also show a significant difference in the average costliness of the services received by children in the different income groups, the costs being highest for the children in $20,000-and-over group. The check-mark distribution is most pronounced when the costs of specialists' services are considered.

The average utilization of medical services by adults between twenty-two and forty years of age by sex is presented in Tables B3 and B4. As expected, females are, on average, higher users and beneficiaries of medical services than males. This is no doubt due to their need for maternity and gynecological services. The great discrepancy in the specialist encounters, specialist costs, and over-all benefits received between females in the income range $0 to $7,999 and those above is probably due to differences in such services and is presumably related to the average family size differences between these income groups. On a per person basis the females in this age group and in the income range exceeding $8,000 receive the highest average benefits of any age group in that income range.

TABLE 9: Summary of per family average utilization and costs of medical services by income class for select family members

Items	$0 - 3,999	$4,000 -7,999	$8,000 -13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Children from 0 to 21 years of age							
Services	11.99	6.43	12.27	12.90	13.72	17.80	2.28†
Encounters	11.14	5.62	11.22	11.67	12.76	16.75	2.53†
PC	137.14	50.95	86.58	108.69	123.86	164.90	4.12*
PC/Service	7.77	6.22	7.34	8.56	10.43	8.03	3.53*
Adults from 40 to 65 years of age							
Services	20.07	13.57	14.79	11.30	12.33	21.05	2.20
Encounters	17.26	11.95	11.82	9.57	10.28	15.93	2.03
PC	212.56	134.42	125.46	104.02	128.49	229.36	3.15+
PC/Service	8.63	9.07	6.52	6.10	8.12	6.37	2.81+
Adults aged 65 years or more							
Services	13.13	16.53	11.80	13.73	35.99	17.37	1.47
Encounters	12.48	12.57	9.65	12.90	32.99	15.11	1.41
PC	104.24	166.19	96.31	133.75	307.41	215.58	2.17
PC/Service	8.22	9.00	9.02	6.06	8.65	9.49	0.25

* significance level of 0.01
\+ significance level of 0.05
† significance level of 0.10

TABLE 10: Summary of per person average utilization and costs of medical services by family income and age class of person

Items	$0 - 3,999	$4,000 -7,999	$8,000 -13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Per child from 0 to 21 years of age							
Services	4.88	2.17	4.12	4.00	4.22	5.62	1.61
PC, spec	26.67	6.44	6.96	9.20	17.10	30.99	4.62*
PC	59.37	17.86	28.31	33.60	39.50	59.15	3.97*
Per male adult of 22 to 40 years of age							
Services	0.94	8.64	6.64	7.55	5.22	6.04	1.89
PC	4.66	47.92	57.34	86.04	62.41	87.26	3.39*
Per female adult of 22 to 40 years of age							
Services	6.33	2.99	8.22	10.15	9.15	8.78	4.86*
Encounters	5.00	2.43	6.72	8.67	7.25	7.30	5.26*
PC	43.82	23.26	105.40	120.54	99.26	125.08	5.24*
Per adult from 40 to 65 years of age							
Services	14.32	9.68	11.06	7.78	8.77	16.30	2.64
PC	158.21	101.01	96.18	74.24	96.74	170.25	3.13+
Per adult aged 65 years or more							
Services	11.11	11.55	7.73	9.41	19.84	12.24	0.89
PC	92.67	102.60	64.63	93.04	176.65	150.79	1.46

* significance level of 0.01
\+ significance level of 0.05

For persons between the ages of forty and sixty-five (see Tables B5 and B6) the picture of the utilization and benefits of medical services is the mirror image of the relationship found for children, that is, a reverse of the check-mark relationship is evident for total benefits on a per family and per person per family basis. The lowest-income individuals are the greatest users and beneficiaries of medical services, with use and benefits decreasing with income except for the highest income groups.

There was no significant difference discovered in the use and benefits received for persons aged sixty-five and over. The subsample of families with persons in this age bracket is rather small, and the variance around the estimates (means) was considerable. Even when grouped into larger income classes no significant differences were found on either a family or a per person per family basis. The detailed information on the utilization, benefits and the sample size is given in Tables B7 and B8.

It is interesting to note for the whole sample a positive association between utilization and age. This conforms with Enterline's results presented in Table 2. This association does not hold for all income classes, however. For example, persons between forty and sixty-five years of age in the income class $0 - 3,999 receive greater number of services and dollar benefits than any other age group in that income class.

The benefits received and utilization of medical services are significantly different across OHIP families of different sizes. This is hardly surprising; one expects larger families to have more physician encounters and services, and hence higher benefits per family, than smaller families. Table 11 reflects this. Single person families receive the least benefits, followed by married couples with no children. Slightly higher benefits are received by single parent families with unmarried, not fully employed children under twenty-one. This distribution by family size is true for encounters, all services, specialists' and general practitioners' services, and

TABLE 11: Average utilization and costs of medical services per family by size of family

Family size Items	Married, no. children	Married, 1 or 2 children	Married, 3+ children	1 person	2+ persons+	F-statistic
Services	19.80	27.39	31.09	11.46	23.54	31.79*
Visits	10.37	15.20	17.31	7.14	13.68	22.17*
Prim Enc	11.99	18.08	20.33	6.84	15.26	37.14*
Spec Enc	4.16	5.55	6.59	2.78	5.52	8.33*
Encounters	16.15	23.65	26.92	9.62	20.78	34.72*
Serv/Enc	1.15	1.12	1.22	0.94	1.18	19.27*
Costs ($)						
PC, Visits	83.77	132.02	143.84	54.07	132.53	19.41*
PC, Prim	106.49	161.40	183.06	56.09	168.64	36.42*
PC, Spec	72.43	112.10	129.89	49.26	83.37	10.34*
PC	178.92	273.49	312.95	105.35	252.01	27.43*
PC/Visits	8.13	8.73	8.30	6.91	9.23	13.01*
PC/Service	9.47	10.55	9.98	7.91	9.75	6.87*
PC/Prim	9.65	9.63	8.75	7.36	10.03	5.82*
PC/Spec	13.86	17.23	18.96	12.72	13.29	5.47*
PC/Enc	11.09	12.05	11.57	8.81	11.10	9.30*
N(weighted)	326	406	166	308	82	Σ = 1,288
N(observed)	246	358	210	236	240	Σ = 1,290

* significance level of 0.01

\+ The 2+ person family refers to one parent with unmarried, not fully employed children under twenty-one.

NOTE: Degrees of freedom: between 4, within 1285

TABLE 12: Average utilization and costs of medical services per capita per family by size of family

Family size / Items	Married, no. children	Married, 1 or 2 children	Married, 3+ children	1 person	2+ persons+	F-statistic
Services	9.97	7.89	5.75	11.46	7.27	12.28*
Visits	5.23	4.37	3.23	7.14	4.25	13.59*
Prim Enc	6.02	5.21	3.78	6.84	4.76	7.89*
Spec Enc	2.11	1.58	1.20	2.78	1.60	7.02*
Encounters	8.13	6.79	4.98	9.62	6.36	11.46*
Costs ($)						
PC, Prim	53.41	46.45	33.58	56.09	52.40	5.64*
PC, Spec	36.63	32.72	23.89	49.26	24.31	6.12*
PC	90.05	79.17	57.47	105.35	76.71	7.31*
N(weighted)	326	406	166	308	82	Σ = 1,288
N(observed)	349	402	230	234	75	Σ = 1,290

NOTE: see notes to Table 11.

benefits. It is interesting to note that the cost per encounter or cost per service is significantly lower for a single-person OHIP family relative to other family sizes. Also, there is very little difference in the costliness of services received by these families.

The per capita utilization and benefits of medical services by family size presents a far different picture than the one outlined above. Table 12 shows that the single-person OHIP family is the greatest user and beneficiary of the medical insurance program, followed by persons who are married with no children. Indeed, the pattern of utilization and benefits per capita is almost the reverse of that obtained for families, except for the position of the one-parent family with children and the two-parent families with one or two children. The data suggest that as family size increases the family utilization of medical services increases also, but less than proportionately.

As discussed in appendix D, OHIP families in locations where hospital facilities or physicians were relatively scarce were expected to have a lower rate of utilization of medical services and hence lower benefits. However, Table 13 suggests no significant difference in the utilization or the benefits per family in the three availability strata. Despite the mean use and benefits favouring the family in the inadequate availability stratum (!) there was such a high variation within each stratum that the differences in the means could not be said to be significant. Nevertheless, the results are surprising at first glance. One explanation for them is that the average family sizes of the weighted sample in the three availability strata are quite different: 3.45 in the inadequate stratum, 2.94 in the adequate stratum, and 2.41 in the excess stratum. One reason for these differences may be the fact that 33 per cent of the weighted number of OHIP families in the excess stratum are single-person families, compared to 19 per cent in the adequate stratum and only 15 per cent in the inadequate stratum. Only 8 per cent of families in the excess stratum have five persons or more, compared to 16 per cent in the adequate stratum and 25 per cent in the

TABLE 13: Average utilization and costs of medical services per family in three health-care-availability areas

Availability strata/items	Inadequate	Adequate	Excess	F-statistic
Encounters	21.03	19.21	17.63	1.12
Services	23.88	21.38	22.59	0.49
Visits	14.01	12.73	11.38	1.50
Prim Enc	15.97	14.63	12.85	2.26
Spec Enc	5.06	4.59	4.78	0.11
Serv/Enc	1.10	1.05	1.17	1.94
Costs ($)				
PC, Visits	113.73	100.82	105.21	0.20
PC, Prim	145.02	129.24	119.12	0.90
PC, Spec	95.74	85.67	89.97	0.13
PC	240.77	214.91	209.10	0.18
N(weighted)	20	768	499	Σ = 1,288
N(observed)	223	687	370	Σ = 1,290

NOTE: Degrees of freedom: between 2, within 1287. N is the number of sample families in the availability-of-health-care-resources strata.

inadequate stratum. Bearing in mind the results of use by family size and per person per family presented in Tables 11 and 12, the apparently higher (though insignificantly so) utilization and benefits by OHIP families in the inadequate and adequate strata compared to those in the excess stratum may not be too surprising.

Family size seems to constitute the major difference between the three strata. The survey data suggested that the average age distribution of the head of the OHIP family does not appear to be significantly different between the strata. Also, except for the fact that a greater proportion of families in the inadequate and adequate strata are in the lowest income class relative to the excess stratum, the family income differences between the strata were not markedly different. About one-quarter of all families have incomes below $8,000 in each of the strata. The average family incomes of the weighted number of families in the three areas, using the midpoints of the income range as the average income per family,(6) were close: $13,600 in the inadequate stratum, $14,000 in the excess stratum, and $14,260 in the adequate stratum.

Standardizing for the differences in family size in the three strata yields the utilization and benefit estimates on a per person per family basis presented in Table 14. The results are consistent with the expectation that persons in the excess strata receive more services and benefits than those in the other strata. No significant difference was found between primary care and specialist physician services. The latter, of course, are costlier than the former.

Some doubt must be cast on the accuracy of the results in Tables 15 and 16, which show the use and benefits of medical services by site of service for families or persons in different income classes. The medical claims from which the

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6 The income ranges used were those adopted in the questionnaire (see appendix E) and not the broader ranges used in the analysis in this chapter. The midpoint for the $20,000+ was assumed to be $22,500. OHIP families with unknown incomes were not considered in the calculations.

TABLE 14: Average utilization and costs of medical services per person per family in three health-care-availability areas

Availability strata/items	Inadequate	Adequate	Excess	F-statistic
Encounters	6.85	7.28	7.98	1.25
Services	7.76	8.09	10.33	8.01*
Visits	4.74	5.05	5.18	0.10
Prim Enc	5.28	5.53	5.69	0.13
Spec Enc	1.57	1.75	2.29	3.37
Costs ($)				
PC, Visits	37.44	38.60	46.16	3.35
PC, Prim	44.83	46.95	52.94	1.93
PC, Spec	29.75	31.29	43.50	5.93*
PC	74.59	78.24	96.43	5.27+
N(weighted)	20	768	499	Σ = 1,288
N(observed)	233	687	370	Σ = 1,290

* significance level of 0.01
\+ significance level of 0.05

NOTE: see also notes to Table 13.

TABLE 15: Average utilization and costs of medical services per family by income class by site of service

Site of Service	Items	$0 - 3,999	$4,000 -7,999	$8,000 -13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Home	Services	0.33	0.29	0.17	0.30	0.29	0.20	0.49
	Enc.	0.31	0.18	0.12	0.18	0.22	0.16	0.71
	PC ($)	3.19	2.43	1.60	2.50	2.02	1.85	0.40
Office	Services	6.73	8.34	8.90	12.38	13.17	16.54	11.80*
	Enc.	6.37	8.10	8.37	12.09	12.88	15.62	13.32*
	PC ($)	44.78	61.71	68.90	101.08	112.76	170.95	12.81*
Clinic	Services	3.39	5.09	6.29	9.20	6.85	7.39	7.12*
	Enc.	2.28	2.93	4.17	5.80	4.21	4.07	5.71*
	PCu ($)	22.85	26.57	42.09	56.92	45.93	48.85	6.36*
Emerg.	Services	0.62	0.28	0.71	1.30	1.06	1.13	9.55*
	Enc.	0.50	0.27	0.62	1.18	0.98	1.13	10.20*
	PC ($)	4.99	1.88	5.56	9.02	7.34	7.52	8.53*
OPD	Services	0.19	0.11	0.21	0.08	0.20	0.08	0.58
	Enc.	0.19	0.11	0.21	0.08	0.20	0.08	0.58
	PC ($)	1.37	1.08	1.70	1.03	1.62	1.32	0.29

TABLE 15 (continued)

Site of Service	Items	$0 - 3,999	$4,000 -7,999	$8,000 -13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Hospital	Services	6.31	2.00	3.92	3.06	3.39	3.21	3.06+
	Enc.	6.04	1.71	3.58	2.92	3.19	2.95	3.55*
	PC ($)	81.92	52.19	74.73	86.47	84.00	92.08	1.26
N(weighted)		125	184	420	319	197	44	Σ = 1,287
N(observed)		163	160	288	275	319	85	Σ = 1,290

* significance level of 0.01
\+ significance level of 0.05

NOTE: Degrees of freedom: between 5, within 1284. N is the number of sample families in income class.

TABLE 16: Average utilization and costs of medical services per person per family by income class by site of service

Site of Service	Items	$0 - 3,999	$4,000 -7,999	$8,000 -13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Home	PC ($)	2.41	1.34	0.55	1.09	0.58	0.98	1.52
	Enc.	0.23	0.11	0.04	0.08	0.06	0.09	1.91
Office	PC ($)	33.93	37.05	30.90	31.17	34.50	64.19	5.98*
	Enc.	4.68	5.06	3.64	3.62	3.97	6.16	5.37*
Clinic	PC ($)	13.91	16.09	17.29	18.69	15.67	22.16	0.93
	Enc.	1.44	1.78	1.53	1.89	1.37	1.85	1.35
Emerg.	PC ($)	2.58	0.85	2.82	2.67	2.16	2.69	3.58*
	Enc.	0.32	0.13	0.30	0.34	0.29	0.38	2.85+
OPD	PC ($)	0.99	0.49	0.76	0.42	0.54	0.53	0.37
	Enc.	0.14	0.05	0.10	0.03	0.06	0.05	0.65
Hospital	PC ($)	44.96	25.51	31.81	26.35	26.32	42.31	2.51
	Enc.	3.33	0.82	1.65	0.95	0.93	1.22	7.16*
N(weighted)		125	184	420	319	197	44	Σ = 1,287
N(observed)		163	160	288	275	319	85	Σ = 1,290

NOTE: see notes to Table 15.

utilization data are derived do not indicate precisely the place where the services were rendered, and the conventions used in processing the data were no more than educated guesses. The results are likely to be highly sensitive to these conventions. The site-of-service information for office, and hospital services is more reliable than that for clinic, emergency, and out-patient department services.(7)

The tables show that the poorest families make significantly greater use of medical services in hospitals than other income groups. It will be recalled that Beck found this to be true in Saskatchewan. For services rendered in physicians' offices there appears to be a positive relationship between utilization per family (in terms of encounters and over-all physician services) and income class. Such a relationship is also evident for the benefits of such services, which for the average family range from about $45 per family for the lowest income class to a high of about $113 per family for the highest income class. For physician services received by persons in their own homes, the data indicate very little difference in encounters, services, or costs of services received by families in the different income groups.

A number of utilization studies have used alternative measures of the socioeconomic status of families in addition to, or instead of, the family income measure. Table 17 presents the utilization and benefits of medical services per family by the registrant's - regarded here as the family head's - Blishen score. The latter is an index of socioeconomic class based on the registrant's occupational, income, and educational characteristics.(8) Table 18 presents the medical utilization

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7 Only the reliability of the information on location of services is being questioned. The cost data associated with the services, the services themselves, and the type of physician rendering the services are considered to be highly reliable.

8 The methodology of establishing a Blishen score in the current analysis is described in Blishen (1958). The Blishen score was assigned to each registrant by the Survey Research Centre, York University.

TABLE 17: Utilization and costs of medical services per family by the registrant's Blishen score

Registrant's Blishen score	Services	Visits	PC, Visits	Public Cost	Encounters	N_w	N_o
1 - 27	17.63	11.97	87.91	179.71	16.00	76	151
27 - 40	21.77	12.12	99.13	226.54	18.75	439	350
41 - 54	21.23	11.64	93.66	190.29	17.75	443	345
55 - 65	24.14	13.19	119.08	247.75	21.01	169	202
65 - 69	26.15	14.41	146.21	246.64	22.39	118	179
F-statistic	2.13	1.04	3.82*	2.51+	2.30		

* significance level of 0.01
\+ significance level of 0.05

NOTE: Degrees of freedom: between 4, within 1,217. N_w and N_o are the weighted and observed number of families.

TABLE 18: Utilization and costs of medical services per person by the registrant's Statistics Canada occupational class

Registrant's occupational class	Services	Visits	PC, Visits	Public Cost	Encounters	N_w	N_o
1100 - 3199	23.11	12.77	124.05	229.32	19.78	282	355
3300 - 6199	20.18	10.71	88.07	181.85	16.70	439	353
7100 - 8399	22.50	13.70	111.38	226.05	19.73	174	236
8400 - 9997	23.36	13.26	102.98	241.55	20.23	350	283
F-statistic	1.54	2.95+	3.65+	3.74+	2.60		

+ significance level of 0.05

NOTE: Degrees of freedom: between 3, within 1,218. N_w and N_o are the weighted and observed number of families.

and benefits data on the basis of four groups of the Statistics Canada (1973) occupational codes established for the registrant. The criteria used in the grouping of codes were homogeneity of the work performed, of educational requirements of the occupation, of work environment, and of industrial processes related to the occupation. A fair amount of judgment is unavoidable in such an exercise. As to whether alternative measures of socioeconomic class would yield over-all results similar to or different than those founded on family income,(9) Tables 17 and 18 suggest that other measures would bring similar results.

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9 There is of course a high degree of correlation between education, occupation, and income, and the results are expected to be similar. The results merely confirm this expectation and provide some comfort that the one-year income data collected through a survey may not be grossly erroneous due to numerous transitory factors.

Chapter 5

Determinants of medical care utilization and alternative benefit incidence estimates

The findings in the previous chapter are surprising. Under a universal, free, public insurance system one might have expected a relatively even distribution of benefits by income class, or on the assumption of a higher level of morbidity among the poor, perhaps even one favouring the lower income classes. Yet except for the lowest income class, average medical benefits actually increase with family income.

Why does the distribution of benefits from the medical insurance plan in Ontario apparently favour the rich? Some of the answers have already been suggested. In part this distribution was due to the differences in the average OHIP family size by income class. Then too, the relatively greater proportion of married women of child-bearing age in the middle and upper classes is another reason. In the lowest income class the greater proportion of persons over the age of sixty-five helps to explain the high benefit levels there. However, the analysis above did not attempt to discover the distribution in family medical benefits if all of these factors were taken into account simultaneously. Nor did the analysis even address the issue of whether or not the family income variable itself may explain the observed distribution.

It is important to note carefully both the empirical question and the statistical methods. The basic objective is to discover the average benefits for OHIP families in the different income classes. The results of the analysis are essentially descriptive, not analytical. More specifically, the question of benefit incidence is quite different from the question whether or not income is an important factor in determining the families' utilization of medical care. Policy-makers are interested not only in how benefits from the health program are distributed among participants by income

class but also in whether income remains an important factor in the utilization of services under a universal, free, public insurance system.

The conventional method of analysis for incidence is cross-tabulation. However, when the OHIP families are grouped by family income class they cannot be expected to be fully comparable in terms of other socioeconomic and demographic characteristics that might explain medical care utilization. If the family income class of the population were all that mattered - a common, if implicit, assumption in many incidence studies - then the incidence estimates of the previous chapter would suffice. But what would be the benefit distribution if the OHIP families were grouped by income class after being made 'similar' or 'comparable' in terms of demographic factors, for instance? For that the incidence estimates of the previous chapter will not do. Alternative estimates must be established to remove entirely the effects of other variables and thus isolate the effects of income alone on the utilization of medical care. The problem is one of statistical control or standardization.

Cross-tabulation and multiple regression analysis are both means to this end. In the current analysis, standardization is much more difficult through cross-tabulation because of the limitations of the sample size. In any case, multiple regression analysis is superior in allowing a greater number of independent variables (and more levels of each variable if desired) for a given sample size than cross-tabulation.(1) The disadvantages of regression analysis are that it is more arduous and complex and that it typically involves assumptions about the relationships between the dependent and independent variables and among the independent variables.

In this chapter an attempt is made to examine the utilization of health care services in terms of a variety of

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1 For an example of a study using both cross-tabulation and multiple regression analysis on cross-section sample data see Hardin and Borus (1971).

independent variables generated by the survey data. Through multivariate techniques it is possible to explore utilization behaviour in such questions as the relative independent importance of various determinant factors, the magnitude and direction of their influence, and the extent of interaction effects between certain independent variables.

The purpose of this chapter is in part to conduct a determinant study, as this type of analysis is often called, as distinct from the incidence analysis of the previous chapter. But its additional purpose is to caution against making simplistic inferences from the incidence results, particularly about the effects of income on the use of medical services. A third objective of the regression analysis is to help explain some of the incidence results presented above; the regression analysis will allow comparison of alternative benefit incidence estimates with those in the previous chapter.

MODEL AND METHODOLOGY

The general hypothesis in the regression analysis is that the OHIP family medical benefits are a function of a variety of factors, including the usual economic, social, and demographic variables. We do not need to identify in detail the multitude of independent determinants that could explain differences in the utilization of medical services. Rather, the analysis focuses on those variables that were of particular interest in the incidence analysis. Nevertheless, all variables must be included if the effects of some of them, such as income, family size, location, and age, are to be isolated accurately. While these variables are of interest in their own right, the most important reason for their inclusion is that failure to take them into account would result in biased and otherwise misleading results.

A single-equation regression model is used. The dependent variable in the analysis may be specified by any one of three alternatives: the expenditure or benefits per family (equal of course to the public cost per family as discussed); the medical

services per family; or physician encounters per family.(2) The values of these dependent variables are for the twelve-month period of the study. The unit of observation is the OHIP family. However defined, the dependent variable is always specified to be continuous. The analysis is performed using the weighted sample.

The independent variables are all dummy variables.(3) A dummy specification is the only way to represent some of the qualitative variables, such as sex and labour force status, and is usually the way to represent variables such as location or when it is thought that only broad groupings of the independent variable are relevant.(4) However, our primary interest is in the differential utilization or benefits in terms of family income, age of family head, family size, and so forth, even variables that could be continuous are specified in a dummy form. There are several advantages to this approach. If age or income were treated as a continuous variable, the coefficient would only show the effect on the average of one unit change in income or age, assuming the relationships to be linear. When there is no strong theoretical reason for assuming a linear relationship, or for that matter any other specific functional form, it is preferable to use dummy

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2 No matter which alternative is analysed, several breakdowns of the dependent variable could be used in the model. For instance, one could use total, or general practitioner, or specialist encounters as the dependent variable.

3 A regression analysis in which the independent variables are all dummy variables is equivalent to analysis of variance (ANOVA). For a concrete illustration of how ANOVA is equivalent to regression using dummy variables only, see Wonnacott and Wonnacott (1969, chap. 10).

4 For present purposes it is not necessary, nor are there very good reasons, to specify the dependent variables in dummy form. However, a regression analysis could be conducted where the dependent variable is a dichotomy. For the way such an analysis may be conducted and interpreted see Orcutt et al. (1961). For a review of the estimation methods proposed to analyse the variation of dichotomous dependent variables see Goldfeld and Quandt (1972, chap. 4).

variables, since they allow for non-linearities in the relationships. The regression coefficients are 'free' to reflect any curvilinearity in the relationship.(5) In effect, a dummy specification of a variable approximates a curvilinear relationship by a step function. A further advantage of dummy variables is that they permit a flexible handling of missing information. A separate dummy variable accounts for the 'not ascertained' or 'unknown' cases of each classification or interval code. This saves all the other information available about these cases, and may even indicate whether there is something peculiar about those who did not answer a particular question. Most important, however, the dummy form of the variables permits a fairly straightforward comparison with the benefit incidence results of the previous chapter. The estimation technique used in the analysis is ordinary least squares. A regression of the dependent variables on all dummy variables yields coefficients which are deviations from the intercept. These can then be used to derive the cell means (Johnston, 1960).

Purists from the regression school may wonder about the assumptions of normally distributed explanatory variables. Specifically, how can a variable which takes only the values 0 and 1 be normally distributed? 'Actually regression, particularly if interpreted in terms of power in reducing unexplained variance, not as a set of significance tests, is relatively robust under departures from this normality assumption. Trouble arises when for some subclass almost everyone is either 0 (no cases, so high sampling variability) or 1 (no variance, so no explanatory power) but these problems become obvious if the tables give the number of cases' (Lansing and Morgan, 1971, 327). Such phenomena do occur in survey research, as will be evident from the few examples cited later on. Such variables were thus not included in the regression analysis.

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5 See Goldberger (1964, 218-27) for a detailed discussion of the technique.

The question often arises whether valuable information is not lost by converting a numerical variable into a set of subclasses which are assigned dummy variables. Is the flexibility (non-linearity) allowed achieved with a great loss in precision? This problem in the present context is not serious, because most of the variables are not in a continuous form anyway.(6) In any case, 'with most survey data, errors of measurement are sufficiently large that some of the "lost precision" is spurious, and the extreme cases which tend to dominate the results of numerical least-squares estimates, are particularly likely to contain either conceptual or measurement errors' (ibid, 325). For example, using a single dummy variable for everyone who took more than thirty minutes to travel to the doctor's office may keep a person coded as having taken 3.0 hours (perhaps erroneously) from dominating the estimates.

The relationship of the dependent variable to the several independent variables may be characterized by whether the size of the effect exerted by one independent variable depends on the value of another. One inevitable problem encountered in the powerful simultaneous determination of the effects of many variables in multiple regression analysis is the required assumption of additivity and universality. That is, a variable which affects the dependent variable does so with the same impact in all the parts of the population, so that its effects can be added to the effects of other variables. Many studies of medical care utilization impose this restriction on the analysis.

The independent variables used here are unlikely to have a unique effect isolated from others. The additivity assumption is very powerful statistically in reducing complexity, but it is usually violated in the real world. Economic, socioeconomic, and demographic variables typically interact.

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6 The only variables that could be used in a continuous form are age, time (waiting time at doctor's office, travel time to physician), and travel distance to physician and hospital.

Two independent variables are said to interact when the effect of one independent variable depends on the value of another. Results are more meaningful and less likely to be misleading when these interactions are incorporated into the analysis. Indeed, for this reason alone there is merit in specifying variables.

It is impossible, of course, to take full account of all interacting variables. The possibilities are astronomical, particularly if one allows for higher-order interactions (i.e. if the effect of one variable depends on the value of two or more independent variables). In this study, only a limited number of interactions suggested by intuition, reason, or other utilization studies, are examined.(7)

As will be evident later, the dummy variable approach can be readily extended to incorporate these interaction effects. In essence, a new variable is defined in terms of a combination of two independent variables. The approach does require extensive survey observations, however. Care must be taken to assure that sufficient observations are represented by the dummy interaction variables to provide reliable estimates of the mean values (Johnston, 1960, 227). Otherwise, as we have seen, there is a problem of very high sampling variability or no explanatory power.

The following definitions of the various independent variables are used in the regression analysis:

INC1	1 if family income is greater than or equal to $0 and less than or equal to $3,999; 0 otherwise.
INC2	1 if family income is greater than or equal to $4,000 and less than or equal to $7,999; 0 otherwise.
INC3	1 if family income is greater than or equal to $8,000 and less than or equal to $13,999; 0 otherwise.

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7 Running separate regressions on subgroups of the sample is a cumbersome, time-consuming, and expensive way to look for interactions among variables. For what is involved in a more systematic search for interactions see Sonquist and Morgan (1964).

INC4	1 if family income is greater than or equal to $14,000 or less than or equal to $19,999; 0 otherwise.
INC5	1 if family income is greater than or equal to $20,000; 0 otherwise.
INC6	1 if family income is not known; 0 otherwise.
INDQ	1 if family is resident in an inadequately supplied area in terms of health care resources; 0 otherwise.
ADEQ	1 if family is from an adequately supplied area; 0 otherwise.
EXSS	1 if family is from an excess supplied area; 0 otherwise.
FAM1	1 if OHIP family consists of a married couple with no children; 0 otherwise.
FAM2	1 if OHIP family consists of a married couple with one or two children; 0 otherwise.
FAM3	1 if OHIP family consists of a married couple with three or more children; 0 otherwise.
FAM4	1 if OHIP family consists of one person only; 0 otherwise.
FAM5	1 if OHIP family consists of a single parent with children; 0 otherwise.
HAGE1	1 if head of OHIP family is of 18 to 34 years of age; 0 otherwise.
HAGE2	1 if head of OHIP family is of 35 to 49 years of age; 0 otherwise.
HAGE3	1 if head of OHIP family is of 50 to 64 years of age; 0 otherwise.
HAGE4	1 if head of OHIP family is of 65 years of age or more; 0 otherwise.
SAGE1	1 if spouse is between 18 and 44 years of age; 0 otherwise.
SAGE2	1 if spouse is between 45 and 64 years of age; 0 otherwise.
SAGE3	1 if spouse is 65 years of age or more; 0 otherwise.
SEDU1	1 if spouse has not passed high school; 0 otherwise.

SEDU2 1 if spouse has only graduated from high school; 0 otherwise.

SEDU3 1 if spouse has technical training or some college or university education; 0 otherwise.

SEDU4 1 if spouse has graduated with a university degree; 0 otherwise.

HEDU1 1 if head of family has not passed high school; 0 otherwise.

HEDU2 1 if head of family has only graduated from high school; 0 otherwise.

HEDU3 1 if head of family has technical training or some college or university education; 0 otherwise.

HEDU4 1 if head of family has graduated with university degree; 0 otherwise.

WAIT1 1 if minutes waited at doctor's office is $\leq$ 5; 0 otherwise.

WAIT2 1 if waiting time is $>$ 5 and $\leq$ 15 min; 0 otherwise.

WAIT3 1 if waiting time is $>$ 15 and $\leq$ 30 min; 0 otherwise.

WAIT4 1 if waiting time is $>$ 30 minutes; 0 otherwise.

TRAV1 1 if travel time to doctor's office is $\leq$ 5 min; 0 otherwise.

TRAV2 1 if travel time is $>$ 5 and $\leq$ 15 minutes; 0 otherwise.

TRAV3 1 if travel time is $>$ 15 and $\leq$ 30 minutes; 0 otherwise.

TRAV4 1 if travel time is $>$ 30 minutes; 0 otherwise.

NRDOC 1 if any of registrant, spouse, or children do not have a regular physician to visit; 0 otherwise.

RDOC 1 if the family members do have a regular physician to visit; 0 otherwise.

REMP1 1 if head of family is self-employed or employed full-time; 0 otherwise.

REMP2 1 if head of family is employed part-time, laid off, or unemployed; 0 otherwise.

REMP3 1 if head of family is retired or disabled; 0 otherwise.

REMP4 1 if head of family is a full-time student or housewife; 0 otherwise.

SEMP1 1 if spouse is self-employed or employed full-time; 0 otherwise.

SEMP2 1 if spouse is employed part-time, laid-off temporarily, or unemployed; 0 otherwise.

SEMP3 1 if spouse is retired or disabled; 0 otherwise.

SEMP4 1 if spouse is a full-time student or housewife; 0 otherwise.

APPO1 1 if the number of days to make an appointment with a doctor is less than or equal to 3 days; 0 otherwise.

APPO10 1 if the number of days to make an appointment with a doctor is greater than or equal to 4 days; 0 otherwise.

DIST1 1 if the distance to physicians office is less than or equal to 4 miles; 0 otherwise.

DIST10 1 if the distance to physicians office is greater than 4 miles, 0 otherwise.

The following interaction terms are also used as independent variables in the regression analysis. They are defined as combinations of two or more independent variables. Most of which have been mentioned above, but which, in a few instances, involve new variables.

FMIN1 1 if a family has children (FAM2, FAM3, FAM5) and the family income is equal to or in excess of $14,000 (INC4, INC5); 0 otherwise.

FMIN10 1 if a family has children and the family income is less than $14,000; 0 otherwise.

FMIN0 1 if the family size and income combinations is other than those in FMIN1; 0 otherwise.

INAG2 1 if the age of family head is 50 years or more (HAGE3, HAGE4) and the family income is greater than or equal to $14,000 (INC4, INC5); 0 otherwise.

INAG20 1 if the age of the family head is greater than 50 years and the family income is less than $14,000; 0 otherwise.

INAG0 1 if family income and age of the head of family are other than those in INAG2 and INAG20; 0 otherwise.

WTMP3 1 for those who are fully or self employed (REMP1)

and whose waiting time at doctor's office is greater than 20 minutes; 0 otherwise.

WTMP30 1 for those who are not fully or self-employed (REMP2, REMP3, REMP4) and whose waiting time at physician's office is greater than 20 minutes; 0 otherwise.

WTMP0 1 for all combinations of labour force status and waiting time not included in WTMP3 and WTMP30; 0 otherwise.

TTMP4 1 for those who are fully or self-employed (REMP1) and whose travel time to doctor's office is greater than 20 minutes; 0 otherwise.

TTMP40 1 for those who are in REMP2, REMP3, REMP4 and whose travel time to doctor's office is greater than 20 minutes; 0 otherwise.

TTMP0 1 for all combinations of labour force status and travel time not included in TTMP4 and TTMP40; 0 otherwise.

THE FORM OF THE REGRESSIONS

Before discussing the results and implications of the regression a brief, general interpretation of their form is necessary. Normally, the regressions are estimated by excluding one dummy variable from each set or category (income age, family size, etc.) in the equations. The result is that the remaining coefficients are all interpreted in terms of differences from the excluded group. The effects of being in the excluded groups are pooled into the intercept or constant term.(8) For example, in equation 1 (Table 19) the family medical benefits are presented as a function only of family income class. Reference is made here to the 'unadjusted' form of the dummy variable regression, which is how they are usually

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8 For an explanation of the problem in algebraic terms and the interpretation of the coefficients of the regression see Johnston (1960, 221-3).

TABLE 19: Regression coefficients, total costs per family by family income class (standard errors in parentheses)

	Equation 1	
	Coefficient	
Variable	Unadjusted	Adjusted
INC 1	-42.86 (26.97)	-56.69
INC 2	-56.19 (23.48)	-70.01
INC 3	- -	-13.83
INC 4	54.86 (19.84)	41.03
INC 5	51.59 (22.94)	37.76
INC 6	120.63 (41.79)	106.80
Constant	202.11 (13.40)	215.94

R^2 = 0.030, Regression F = 7.87

NOTE: The adjusted constant is the weighted average family medical benefits for the whole sample. The adjusted constant plus (or minus) the adjusted coefficient on the income class variable yields results comparable with those presented in Table 7.

presented. The dummy variable INC 3 is excluded. Since only one independent variable is used, the constant represents the mean medical benefits of families in INC 3, namely $202.11. (It is noted that this is almost identical to the value established in chapter 4.) The mean benefits for families in other classes are derived simply by adding (or subtracting as the sign may indicate) the coefficient of the variable to (or from) the constant.

Things become more complicated when an equation has several variables. For example, in equation 4 (Table 20) the (unadjusted) constant represents the exluded dummies INC 3, HAGE 4, and FAM 5. Since the coefficients are in terms of differences from the excluded dummy variables, the result is not very meaningful nor as informative as desired. For instance, from the unadjusted equation 4 one cannot know what the average benefit even for families in income class 1 is, let alone for those in INC 3, the excluded group.(9) It is much simpler and more informative if the coefficients could be interpreted as differences, not from the excluded group, but from some known and stable base; this is precisely what is achieved in the regression equations referred to as 'adjusted' in the tables that follow.

The adjusted form of the regression equation is mathematically identical to the unadjusted form. What happens is that each set of unadjusted coefficients is transformed by adding a constant to each coefficient (including the zero for the excluded dummy variable), so that their weighted sum will equal zero. This constant is then subtracted from the

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9 There are still other problems with the unadjusted equations. The constant term could be quite erratic from one equation to the next. Also, the coefficients can have a large erratic shift when the excluded group has a widely deviant mean (see Lansing and Morgan, 1971, 317).

TABLE 20: Total medical costs per family and family characteristics (standard errors in parentheses)

	Equation 2		Equation 3		Equation 4		Equation 5	
	Coefficient		Coefficient		Coefficient		Coefficient	
Variable	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.
Constant	175.52 (26.90)	215.94	241.72 (31.64)	215.94	270.74 (41.57)	215.94	262.06 (42.12)	215.94
INC 1	-29.87 (29.43)	-45.82	23.03 (27.56)	13.143	6.16 (29.83)	-1.39	14.30 (30.51)	-5.03
INC 2	-46.78 (24.03)	-62.73	-20.39 (23.53)	-29.99	-28.56 (24.09)	-36.12	-28.96 (24.02)	-38.23
INC 3	-	-15.95	-	-9.59	-	-7.56	-	-9.27
INC 4	56.90 (19.73)	40.95	11.37 (19.94)	1.77	15.65 (19.98)	8.09	16.99 (20.62)	7.73
INC 5	43.44 (23.95)	27.49	18.33 (22.83)	8.73	18.53 (22.78)	10.98	23.24 (23.08)	13.98
INC 6	126.50 (41.93)	110.55	128.79 (40.80)	119.19	120.77 (41.08)	113.21	117.00 (41.19)	107.74
HAGE 1	-11.67 (26.29)	-36.14			-46.67 (26.30)	-28.28	-49.23 (26.38)	-28.90

TABLE 20: (continued)

Variable	Equation 2 Coefficient Unadj.	Equation 2 Coefficient Adj.	Equation 3 Coefficient Unadj.	Equation 3 Coefficient Adj.	Equation 4 Coefficient Unadj.	Equation 4 Coefficient Adj.	Equation 5 Coefficient Unadj.	Equation 5 Coefficient Adj.
HAGE 2	68.50 (27.59)	44.03			-14.67 (28.91)	3.71	-16.96 (28.97)	3.38
HAGE 3	43.78 (27.58)	19.31			12.81 (27.24)	31.20	11.09 (27.27)	31.44
HAGE 4		-24.47				18.38		20.34
FAM 1			-74.60 (31.66)	-39.22	-92.11 (32.89)	-48.13	-91.00 (32.91)	-48.18
FAM 2			25.99 (31.73)	61.38	17.77 (31.84)	61.75	19.81 (31.89)	62.63
FAM 3			63.09 (35.08)	98.48	53.99 (35.33)	97.97	58.33 (35.53)	101.16
FAM 4			-146.01 (32.83)	-110.63	-146.89 (33.32)	-102.92	-148.52 (33.44)	-105.69
FAM 5				35.38		43.98		44.83
INDQ							7.29 (56.99)	-0.49
ADEQ								-7.77

TABLE 20: (continued)

Variable	Equation 2 Coefficient Unadj.	Equation 2 Coefficient Adj.	Equation 3 Coefficient Unadj.	Equation 3 Coefficient Adj.	Equation 4 Coefficient Unadj.	Equation 4 Coefficient Adj.	Equation 5 Coefficient Unadj.	Equation 5 Coefficient Adj.
EXSS							20.35 (15.80)	12.58
Regression F =	7.64		14.22		11.54			10.00
Partial F :								
Income	6.37+		2.65*		2.59*			2.61*
Age	7.07+		-		3.25*			3.37*
Family Size	-		21.53+		18.49+			18.87+
Supply Area	-		-		-			0.83
Incremental R^2:								
Income	0.024		0.009		0.009			0.009
Age	0.016		-		0.007			0.007
Family Size	-		0.061		0.052			0.053
Supply Area	-		-		-			0.001
R^2	0.046		0.091		0.098			0.099

* significance level of 0.05
\+ significance level of 0.01

unadjusted constant term to yield the adjusted constant.(10) If the weighted sum of each set of independent variables is zero in all the adjusted equations, the (adjusted) constant will be the same from one equation to the next. Indeed, it is the value of the average medical benefits per family for the whole sample. In the adjusted form of the regression equations the coefficients are interpreted as differences from this overall sample average (and not from some unknown excluded group). This transformation also yields the coefficients of the excluded dummy variables, thus adding information often left out in the normal presentation of the regression results.(11)

Each group, i.e. the dummy variable within each category, has a coefficient which indicates how much can be added or subtracted from the global average (i.e. the adjusted constant) to estimate the average benefit for that particular group, given similarity of all other characteristics between the total universe and the group under consideration (i.e. if the group and the whole sample were similar in terms of all the other characteristics included in the regression equation).

The statistical significance of the entire regression is judged by the F-statistics for the total regressions, given of course the degrees of freedom. The statistical significance of a group of coefficients, i.e. the variable category as a whole, is determined by the partial F-statistic.

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10 For an example of such a transformation see Lansing and Morgan (1971, 318). The basic concept can be readily seen in Table 22. The value of the constant that will make the weighted sum of the adjusted coefficients equal to zero is -13.83. Thus -13.83 is added to each of the unadjusted income coefficients and subtracted from the unadjusted constant. Incidentally, it follows that one property of the regression equations is that the difference between a pair of adjusted coefficients is equal to that between the unadjusted coefficients of the same variables.

11 A further advantage of the adjusted form appears when one wishes to compare similar regressions estimated for another sample, or a different type or place.

In interpreting the results of a dummy variable regression, one is often interested in the relative importance of the various variables regarded as characteristics, such as family income, education, age, location, and so on. An indicator of such relative importance of particular variables is the incremental R^2. In the adjusted form of the regression equations, the t-statistic (derived by dividing the coefficient of a variable by its standard error) is used to test for the significance of the coefficient being different from the constant. However, whether or not there is a significant difference between the coefficient of two variables from the same set is determined by a t-test for pairwise combinations of coefficients. The difference between the coefficients of two income variables is the difference between the benefit estimates for the two income classes. For example, in equation 1 (Table 19), the average benefit per family in INC 1 is $215.94 minus $56.69, or $159.25, and that for INC 5 is $215.94 minus $37.76, or $253.70. The difference between these estimates is $94.45, which is the same as the difference between the two coefficients INC1 and INC5 (37.76 - (-56.69)). This test therefore becomes important in a benefit incidence analysis of a public program if it is necessary to establish whether or not a benefit estimate for a particular income class is significantly different from that established for another income class. (It will be recalled that in chapter 4 the F-statistic tested for the significance of the difference among the entire set of estimates, not between one benefit estimate and another.

For each equation a table of t-statistics of pairwise comparisons of dummy coefficients may be established if desired. In Table 21 an example of such a set of t-statistics for the income coefficients of equation 1 is presented.(12)

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12 The ten t-values are calculated in the following manner: $t_{X_iX_j} = X_i - X_j / \sqrt{(VARX_i + VARX_j + 2\ COVX_iX_j)}$ where X_i, X_j are coefficients of INC_i, INC_j, $i \neq j$, $VARX_i$ is the variance of the coefficient X_i, and $COVX_iX_j$ is the covariance between X_i and X_j.

TABLE 21: t-statistics for pairwise comparison of dummy coefficients of regression equation 1 presented in Table 19

	Inc 2	Inc 3	Inc 4	Inc 5
Inc 1	-0.30	1.59	2.58*	2.36*
Inc 2		2.39+	2.82*	2.84*
Inc 3			2.76*	2.25+
Inc 4				-0.09

* level of significance of 0.01
\+ level of significance of 0.05

NOTE: Inc 6 representing the unknown income class is ignored in the pairwise comparisons. Degree of freedom is infinite.

Obviously equations with many variables have rather lengthy tables of t-statistics. For reasons of space, only the main findings implied by these statistics will be presented in the following discussion.

A selected number of regression equations are given in Tables 20 and 22 to 26 in which the family medical benefits are regressed against the various socioeconomic and demographic variables, with particular attention being paid to those variables identified earlier as important. The tables are followed by a discussion of the incidence results.

THE RESULTS OF THE REGRESSION ANALYSIS

From each equation presented in the tables the average medical benefits per family in each income class are derived simply by adding the coefficient of the income variables to the constant. Taking equation 5 (Table 20) for example, the average benefits for families in income class $0-3,999 is $215.94 (the constant) plus -5.03 (the coefficient, of INC1) i.e. $210.91. The incidence results derived from equations 1 to 10 are summarized in Table 27, although the incidence estimates for the unknown income class are not given there. The results of the t-test for significance of the difference between any two estimates of each equation are also presented. Rather than assemble the data as in Table 22 for each equation, the results are summarily presented in the brackets below the incidence estimates in Table 27. For example, the items bracketed under the incidence estimate for families in income class $0-3,999 in equation 1 mean that the average medical benefits per family in this income class are significantly different from the average benefits of families in income class $14,000-19,999 and $20,000+. For the sake of space, a simple 'I' rather than INC is used to refer to the particular income class.

It is apparent from Table 27 that the benefit incidence estimates obtained for the populations grouped by family income class depend upon how the OHIP families are standardized.

TABLE 22: Total medical costs per family versus demographic, geographic, and educational characteristics of the family

	Equation 6			
Variable	Adjusted coefficient	Standard error	Partial F	Incremental R^2
INC1	21.71	30.77		
INC2	-31.93	24.14		
INC3	- 9.65	-	2.16	0.008
INC4	2.74	19.90		
INC5	8.64	24.61		
INC6	97.51	41.06		
FAM1	-85.80	41.80		
FAM2	17.33	41.52	10.99+	0.031
FAM3	47.03	44.81		
FAM4	-107.95	35.65		
FAM5	16.31			
INDQ	-1.79	56.64		
ADEQ	-6.74	-	0.62	0.001
EXSS	10.97	15.86		
HAGE1	-27.92	26.39		
HAGE2	7.50	28.83	2.88*	0.006
HAGE3	27.24	27.10		
HAGE4	16.00	-		
SEDU1	-30.01	45.74		
SEDU2	30.90	-		
SEDU3	14.51	26.55	6.27+	0.017
SEDU4	80.23	30.33		
Constant	215.94	55.91		

R^2 = 0.116, Regression F = 9.30

* significance level of 0.05
\+ significance level of 0.01

TABLE 23: Total medical costs per family versus demographic, geographic, and socioeconomic characteristics of the family and appointment time

	Equation 7			
Variable	Adjusted coefficient	Standard error	Partial F	Incremental R^2
INC1	-40.18	33.34		
INC2	-40.39	24.96		
INC3	- 5.32	-	2.32*	0.008
INC4	18.21	19.67		
INC5	25.41	24.32		
INC6	83.38	40.89		
FAM1	-91.51	41.35		
FAM2	26.40	41.00		
FAM3	55.12	44.20	13.98+	0.038
FAM4	-118.28	35.76		
FAM5	2.21	-		
INDQ	-1.52	55.81		
ADEQ	-10.54	-	1.54	0.002
EXSS	17.09	15.76		
HAGE1	- 5.43	32.16		
HAGE2	21.20	33.28	4.95+	0.010
HAGE3	30.61	31.00		
HAGE4	-79.95	-		
SEDU1	-13.68	46.50		
SEDU2	26.32	-	5.86+	0.016
SEDU3	0.7322	26.21		
SEDU4	74.12	25.82		
REMP1	-28.57	-		
REMP2	-27.07	35.01	14.10+	0.0285
REMP3	182.19	33.79		
REMP4	- 7.98	39.99		
Constant	215.94	55.91		

R^2 = 0.145, Regression F = 10.23

* significance level of 0.05
\+ significance level of 0.01

TABLE 24: Total medical costs per family versus demographic, geographic, and socioeconomic characteristics of the family and appointment time

	Equation 8			
Variable	Adjusted coefficient	Standard error	Partial F	Incremental R^2
INC1	-39.80	33.33		
INC2	-39.62	24.97		
INC3	- 5.25	-	2.43*	0.008
INC4	19.13	19.67		
INC5	25.78	24.30		
INC6	84.47	40.86		
FAM1	-90.31	41.37		
FAM2	27.50	41.01		
FAM3	53.53	44.17	13.70+	0.037
FAM4	-126.57	35.75		
FAM5	0.66	-		
INDQ	- 0.42	55.79		
ADEQ	-10.44	-	1.51	0.002
EXSS	16.89	15.75		
HAGE1	- 5.65	32.14		
HAGE2	23.05	33.27	4.88+	0.010
HAGE3	28.59	31.02		
HAGE4	-79.84	-		
SEDU1	-21.03	46.01		
SEDU2	24.82	-		
SEDU3	1.09	26.22	5.88+	0.016
SEDU4	76.57	36.22		
REMP1	-31.79	-		
REMP2	-28.57	35.88	14.16+	0.029
REMP3	182.69	33.77		
REMP4	- 3.99	40.00		
APPO1	6.86	16.24	2.55	0.0017
APPO10	-19.05			
Constant	215.94	57.54		

R^2 = 0.147, Regression F = 9.90

* significance level of 0.05
\+ significance level of 0.01

TABLE 25: Total medical costs per family versus demographic, geographic, and socioeconomic characteristics of the family plus appointment time and regular physician

Variable	Equation 9 Adjusted coefficient	Standard error	Partial F	Incremental R^2
INC1	-39.89	33.24		
INC2	-41.04	24.92		
INC3	- 2.24	-	2.50*	0.008
INC4	15.98	19.70		
INC5	25.96	24.24		
INC6	88.16	40.72		
FAM1	-88.34	41.30		
FAM2	25.13	41.09	13.83+	0.037
FAM3	52.45	44.16		
FAM4	-126.22	35.80		
FAM5	0.44	-		
INDQ	- 3.35	55.59		
ADEQ	-12.28	-	2.09	0.003
EXSS	19.99	15.79		
HAGE1	- 2.25	32.17		
HAGE2	21.74	33.18	5.06+	0.010
HAGE3	27.99	30.96		
HAGE4	-85.47	-		
SEDU1	-20.09	46.27		
SEDU2	20.34	-		
SEDU3	2.06	26.19	5.80+	0.016
SEDU4	80.84	35.88		
NRDOC	-72.23	25.79	9.44+	0.006
RDOC	6.98	-		
REMP1	-28.20	35.05		
REMP2	-26.10	33.66	14.54+	0.029
REMP3	183.89	39.99		
REMP4	-11.83	-		
APPO1	6.40	16.19	2.23	0.0015
APPO10	-17.78	-		
Constant	215.94	57.43		

R^2 = 0.153, Regression F = 9.94

* significance level of 0.05
\+ significance level of 0.01

TABLE 26: Total medical costs per family versus demographic, geographic, and socioeconomic characteristics of the family and travel and waiting time

	Equation 10			
Variable	Adjusted coefficient	Standard error	Partial F	Incremental R^2
INC1	-43.46	33.44		
INC2	-40.86	25.42		
INC3	- 3.32	-	2.15	0.007
INC4	17.36	19.80		
INC5	21.19	24.64		
INC6	75.47	41.18		
FAM1	-88.84	41.55		
FAM2	24.77	41.04	13.44+	0.036
FAM3	56.63	44.20		
FAM4	-121.79	36.15		
FAM5	- 0.53	-		
INDQ	5.59	55.85	2.26	0.003
ADEQ	-13.13	-		
EXSS	20.98	16.07		
HAGE1	- 6.03	32.28		
HAGE2	24.72	33.49	5.31+	0.011
HAGE3	29.49	31.12		
HAGE4	-83.80	-		
SEDU1	-19.99	46.58		
SEDU2	28.68	-	5.04+	0.014
SEDU3	2.23	22.50		
SEDU4	68.92	26.28		
REMP1	-28.31	-		
REMP2	-27.55	35.07	13.65+	0.028
REMP3	180.14	33.95		
REMP4	- 5.83	40.22		

TABLE 26: (continued)

	Equation 10			
Variable	Adjusted coefficient	Standard error	Partial F	Incremental R^2
WAIT1	37.10	-		
WAIT2	- 5.24	22.89	2.87*	0.0058
WAIT3	-23.67	22.02		
WAIT4	3.41	22.74		
TRAV1	13.23	-		
TRAV2	- 7.60	18.33	0.98	0.002
TRAV3	-10.93	21.10		
TRAV4	-14.79	31.60		
Constant	215.94	58.69		

R^2 = 0.152, Regression F = 8.39

* significance level of 0.05
\+ significance level of 0.01

TABLE 27: Alternative incidence estimates of family medical benefits by income class

Equation	I1 $0 - 3,999	I2 $4,000 - 7,999	I3 $ 8,000 - 13,999	I4 $14,000 - 19,999	I5 $20,000 +
1	159.25 (I4*,I5*)	145.93 (I3*,I4*,I5*)	202.11 (I2*,I4*,I5*)	256.97 (I1*,I2*,I3*)	253.70 (I1*,I2*,I3*)
2	170.12 (I4*, I5)	153.21 (I3, I4*,I5*)	199.99 (I1, I4*,I5)	256.89 (I1*,I2*,I3*)	243.43 (I1, I2*,I3)
3	229.37 (-)	185.95 (-)	206.35 (-)	217.71 (-)	224.67 (-)
4	214.55 (-)	179.82 (-)	208.38 (-)	224.03 (-)	226.92 (-)
5	210.91 (-)	177.71 (-)	206.67 (-)	223.67 (-)	229.92 (-)
6	237.65 (-)	184.01 (-)	206.29 (-)	218.68 (-)	224.59 (-)

TABLE 27: (continued)

Equation	I1 $0 - 3,999	I2 $4,000 - 7,999	I3 $ 8,000 - 13,999	I4 $14,000 - 19,999	I5 $20,000 +
7	175.76 (-)	175.55 (-)	210.62 (-)	234.15 (-)	241.35 (-)
8	176.14 (-)	176.32 (-)	210.69 (-)	235.07 (-)	241.72 (-)
9	176.05 (-)	174.90 (I5)	213.70 (-)	231.92 (-)	241.90 (I2)
10	172.48 (-)	175.08 (-)	212.62 (-)	233.30 (-)	237.13 (-)

NOTE: The benefit estimate for an income class is significantly different from the benefit estimate(s) of the income classes cited in the brackets. If an asterisk is present the level of significance is at least 0.05; otherwise it is 0.10.

Equation 1 shows that the average family medical benefits between income class are significantly different when OHIP families are grouped only in terms of their family incomes. These differences persist even when allowances are made for differences in age of the family head (equation 2). When adjustments are made for the fact that the OHIP families vary in terms of the size of the family and the age of the head of the family (equation 4), the significant differences in the incidence estimates shown in equation 1 and equation 2 disappear. When further adjustments are made for differences between the families of the various income classes, in terms of the availability of health care resources (equation 5) and educational status of the spouse (equation 6), no statistically significant difference between the average family benefits across income classes is evident. However, the check-mark distribution of benefits is apparent in all these equations. When further adjustments are made for the differences in the employment status of the family head, no statistically significant difference in the average family medical benefits is apparent (equation 7). However, this adjustment results in the incidence of benefits being positively related to family income class throughout the income scale. An explanation for this straightening-out of the distribution will be offered in due course. Moreover, when account is taken of several other variables that might explain the variation in the medical care benefits received by families (appointment time and whether or not a family has a regular physician) there is a statistically significant difference in benefits received between families in the $20,000+ income class and those in the $4,000-7,999 income class (equation 9).

The objective of the summary in Table 27 showing alternative incidence estimates by family income class is not merely to demonstrate that the benefit distribution will change when one standardizes for different characteristics of the OHIP families; that is of course to be expected. A more important purpose of the summary is to indicate that the difference in family incomes is not a statistically significant variable in

explaining the observed variation in family medical benefits. That is, from the analysis undertaken here it appears that the observed differences in benefits must be explained in terms of other factors, some of which are now to be discussed.

Family size

The family size coefficients increase with the size of the family, as expected. The negative FAM1 (married couple without children) and FAM4 (single persons) coefficients indicate that the average medical benefits of these families is significantly below the average of all families. FAM4 is lower than FAM1 probably because of the absence of a spouse, as found in numerous other studies. It appears that the marginal benefits (the incremental costs due to an additional person in the family) decline as family size increases. The relationship between family size and average medical benefits is highly stable, that is, the coefficients of the family size variables change very little from one equation to the next even when new regressors are introduced. The relationships are not altered with alternative specification of the dependent variable. For example, in equations 11 and 12 (Tables 28 and 29) services per family and physician encounters per family respectively, are the dependent variables. Yet the FAM1 and FAM4 coefficients remain significantly below the average for all families. Also, FAM4 is smaller than FAM1. In all equations the family size variable is significant at the 99 per cent level of significance. Evidently, family size is invariably the single most important variable in acconting for the explained variance; in terms of the incremental R^2 it ranks first of all equations.

Age of the family head

The age variable is sometimes explicitly, but more often implicitly, thought to act as an indicator of health status. Even without evidence of particular illness it can be assumed that the health stock depreciates with increase in age. This

TABLE 28: Total medical services per family versus demographic, geographic, and socioeconomic characteristics of the family

	Equation 11			
Variable	Adjusted coefficient	Standard error	Partial F	Incremental R^2
INC1	0.26	2.85		
INC2	-3.64	2.14		
INC3	-0.64	-	1.52	0.005
INC4	1.56	1.68		
INC5	1.16	2.08		
INC6	3.52	3.50		
FAM1	-7.72	3.54		
FAM2	2.68	3.51	15.38+	0.041
FAM3	7.02	3.78		
FAM4	-8.66	3.06		
FAM5	-1.48	-		
INDQ	-0.62	4.78	3.33*	0.008
ADEQ	-1.02	-		
EXSS	2.97	1.35		
HAGE1	-2.15	2.75		
HAGE2	-0.40	2.84	10.11+	0.020
HAGE3	6.32	2.65		
HAGE4	-3.70	-		
SEDU1	-2.18	1.91		
SEDU2	1.80	-		
SEDU3	1.36	3.06	5.09+	0.014
SEDU4	5.96	3.99		
REMP1	-1.65	-		
REMP2	-0.29	2.99	5.98+	0.012
REMP3	10.12	2.89		
REMP4	-0.77	3.42		
Constant	22.22	5.23		

R^2 = 0.155, Regression F = 11.06

* significance level of 0.05
\+ significance level of 0.01

TABLE 29: Encounters per family versus demographic, geographic, and socioeconomic characteristics of the family

	Equation 12			
Variable	Adjusted coefficient	Standard error	Partial F	Incremental R^2
INC1	0.39	2.45		
INC2	-2.84	1.83		
INC3	-0.35	-	1.28	0.004
INC4	0.98	1.44		
INC5	0.72	1.78		
INC6	3.43	3.00		
FAM1	-7.64	3.03		
FAM2	2.33	3.01		
FAM3	5.85	3.24	18.80+	0.050
FAM4	-8.92	2.63		
FAM5	-0.47	-		
INDQ	-0.56	4.09	0.80	0.0011
ADEQ	0.03	-		
EXSS	0.90	1.16		
HAGE1	-1.51	2.36		
HAGE2	-0.49	2.44	8.40+	0.017
HAGE3	4.98	2.27		
HAGE4	-2.05	-		
SEDU1	-3.51	3.01		
SEDU2	2.44	-	5.37+	0.014
SEDU3	1.66	1.92		
SEDU4	5.64	2.63		
REMP1	-1.35	-		
REMP2	-1.06	2.57	6.63+	0.013
REMP3	8.94	2.48		
REMP4	-1.69	2.94		
Constant	18.93	4.10		

R^2 = 0.156, Regression F = 11.13

* significance level of 0.05
\+ significance level of 0.01

assumption is made of individuals, and age serves as a health status or morbidity measure more appropriately if the dependent variable is specified in individual terms rather than in terms of the OHIP family as done in this study. That is, one can reasonably expect persons sixty-five or over to be considerably greater consumers of medical services than those in the younger age classes, and that was demonstrated in chapter 4. But this may not hold for the families whose heads are defined in terms of such age classes. One major difference is that the heads of families in the lower age classes are more likely to have spouses in their fertility years, whereas for those sixty-five and over this is rather unlikely. Another difference is that the OHIP family with the 65-plus head is quite often a one- or two-person family and hence smaller than those whose heads are in the younger age groups (HAGE2, HAGE3). In brief, there is not a straightforward one-to-one relationship between health needs as indicated by the age of the head of family unit and the needs of the family unit as a whole.

In the regression analysis the sets of variables defining the head of family (HAGE) and spouse's age (SAGE) were examined in turn. It appears that the HAGE variables were more significant in explaining the variation in family medical benefits, and thus only the results relating to HAGE are reported. In all the regression equations the HAGE variables were significant at least at the 95 per cent level of significance. When either services per family or encounters per family are specified as the dependent variable, HAGE is significant at the 99 per cent level of significance. The relationship (i.e. as reflected by the signs and relative size of the coefficients of both HAGE and SAGE variables) between family medical benefits and the age of either spouse or head is very similar however.

As can be seen from equations 4, 5, or 6 in Tables 20 and 22, even after controlling for family size differences, while the age coefficients generally increase with the age of the head of the family, the HAGE4 coefficient is not the

largest.(13) (The surprising negative coefficient of HAGE4 in equation 7 and later equations will be discussed later.) One reason may well be whether or not the OHIP family contains a spouse in her fertility years. Another possibility is that many of the aged people receive care in domiciliary institutions (such as nursing homes), clinics, or home-care programs and thus a disproportionate amount of care from salaried professionals. This could mean that these services may not be recorded in the OHIP files, which is the source of the utilization data for this study.

Education

The education variable is often used to reflect tastes or preferences for medical care services. It can be argued that with more education individuals become more aware of medical symptoms and the value of maintaining or augmenting their stock of health or human capital. The higher-educated are presumably also more informed about and have greater interactive skills vis-a-vis the health care delivery systems and professionals. On the other hand it has been suggested that those with more education are more efficient 'producers' of health and would substitute preventive and self-care for physician care services, leading one to expect a negative relationship between health care utilization and educational level.

The relationship between the demand for health care and education is quite complex. One hypothesis is that the causal relationship runs from more education to increase in demand for health. Another holds that 'the direction of causality runs from better health to more schooling. The third argues that no causal relationship is implied by the corelation (between health and schooling). Instead, differences in one or more "third variables," such as physical and mental ability and parental characteristics, affect both health and schooling in the same direction' (Grossman, 1975).

13 Similar results for the age of head variables have been found in other studies, (see for example Wilensky and Holahan, 1972, 73).

The levels of education of both the head and the spouse were examined in turn in the regression analysis. The results were similar, showing significantly greater dollar benefits of medical care services associated with the higher (SEDU4, HEDU4) educational status. However, the level of education of the spouse explained more of the variance (higher incremental R^2) and was the more significant variable than the family head's education. This is probably due to the fact that the spouse is primarily responsible for the health of the family, particularly her own and the children's.

Indirect costs

On the assumption that medical care is a normal good, one should expect a positive relationship between health care utilization or benefits and family income. It could be argued that while there are no direct charges in physician bills in the current system - excepting the opted-out physician - people nevertheless incur other costs in obtaining medical care: as income increases the burden of daycare, transportation, drugs, and other costs decreases.

However, the survey data on variables that may be referred to as dealing with 'indirect' costs, such as transportation, babysitting, loss of earnings, and drug and appliance costs associated with receiving medical care, were not used in the regression analysis. The survey results show very little variation by the sample families in terms of these indirect costs. For example, only 10 per cent of the respondents experienced any difficulties in taking time off work for a medical visit. Only about half of them (5.1 per cent) had loss of earnings because of a medical visit. Less than 5 per cent of the families experienced babysitting costs for visits to physicians. Perhaps because the respondents could not understand the issue of transportation costs well enough, a large proportion had no costs or costs of less than $1. Given these difficulties, as well as the fact that the response relates to one individual in the family for just one occasion,

no analysis of these survey responses was made. This does not mean that these indirect costs are not important in relation to the utilization of medical care, but rather that the significance or otherwise of the relationship between these indirect costs and medical care utilization cannot be demonstrated because of insufficient sample variance.

Employment status

The benefit incidence estimates derived from the first six equations indicate a negative relationship between medical care use and family income between the poorest and the next lowest income groups. For the rest of the income range there is a positive relationship between income and medical care benefits. The resulting check-mark distribution was of course the main finding of the previous chapter.

The higher medical benefits received by the families in the lowest income class may be attributable to a markedly poorer health status or higher level of morbidity of that group relative to those in the other income classes. Since access to medical care is 'free,' it might be expected that those with the lowest health status would exhibit greater utilization. Most important, the effect of income on the use of medical services may be obscured by the failure to adjust for difference in health status.(14)

The need for medical care is not well defined, and operational measures of health status are difficult to establish. However, a few studies employing various indicators of morbidity have shown that health status does play a predominant role in determining medical care utilization. For example, in a recent study Davis and Reynolds (1975) found that variables describing chronic conditions, limitations in normal activities, and restricted activity days all contributed

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14 One implication is that estimates of the income elasticities of demand for medical care derived from analyses that have ignored health status considerations, as is quite commonly done in many utilization studies, are suspect.

positively to utilization and were highly significant. This is hardly surprising of course. More relevant for our purposes, however, is their finding that a simple cross-tabulation of physician visits by income class showed a check-mark distribution similar to that found in the present study (i.e. visits increasing with income class, except that the lowest income group [under $5,000] had higher visits than those in the next income class [$5,000 to $9,999]). However, 'when adjustment is made for health status, physician visits increase uniformly with income' (Davis and Reynolds, 1975, 368).

Unfortunately no direct measures of morbidity or health status are available for the present study. But one proxy measure of health status found here may be the employment status of the head of the OHIP family. REMP3, for instance, covering family heads who are retired or disabled, entails a higher level of morbidity than REMP1 (fully-employed or self-employed), REMP2 (those who are unemployed or employed part-time but presumed still able to work), and REMP4 (students and housewives).(15) Not that labour force status as defined by the REMP dummy variables is necessarily a good proxy health status variable; the REMP variables may have other, perhaps even more important, implications than that for health status. For instance, REMP3 families have a much greater proportion of 'unearned' income (16) relative to other groups, and hence zero or near-zero forgone earnings if and when obtaining health care services. More generally, REMP3 means a considerably lower opportunity cost on account of the much greater amount of free time available to those who are retired or disabled.

The employment status of the head is far more important than that of the spouse in explaining the variance in medical

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15 As can be seen from Question 10 (b) of Part II of the questionnaire in appendix C, individuals were classed as 'retired or disabled'. Regrettably, it is difficult to separate them into two distinct categories.

16 If one is prepared to call disability pensions and other retirement incomes 'non-earned', then most of the income of this group may be unearned.

care benefits of OHIP families. Only the regression equations with REMP variables are reported here, and it is clear from the partial F and the incremental R^2 statistics that it is a highly significant variable. In all equations that include REMP variables, the coefficient of REMP3 is positive and highly significant.

The implications of introducing the REMP variables can be observed by comparing the results of regression equation 5 to those of equation 6. The two striking differences between the results are the drop in benefits received by families in INC1 and in HAGE4. The correlation between INC1 and REMP3 is 0.48, and the correlation between HAGE4 and REMP3 is 0.65. Such results are therefore not all that surprising. The family whose head is retired or disabled is more likely to have low income, and the head of a family who is sixty-five or more is likely to be in the retired or disabled employment status. The result may thus be interpreted in the following manner. Those in the lower income class would have received less medical benefits than those in the higher income classes if they were comparable in terms of the various characteristics reflected by the variables included in the equation 6. Or, alternatively, their higher benefits reflected in equation 5 are in part due to the fact that the families in INC1 are more ill and need more care than those in the other income brackets. The drop in HAGE4 (indeed a negative sign) occurs because REMP3 picks up the effect of the aged being retired or disabled. Perhaps REMP3 controls for health status to such a degree that HAGE4 is left to reflect the physical accessibility of the elderly to physician care.(17)

Incidentally, there are other indications of the poorer health status of people in the lowest income class. One could argue that there is prima facie evidence of a higher level of morbidity or a higher level of severity of illness when a physician sees a patient in a hospital or goes to the patient's

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17 A similar result on the age variable and its interpretation is also found in Davis and Reynolds (1975, 368).

home. As we have seen, the poor do receive relatively more benefits (encounters, services) in hospital and at home on both an OHIP family and a per person basis.

The availability of health care resources

The effect on utilization of the supply and geographical distribution of health care resources is of considerable concern to policy-makers. It has been argued that an increase in the supply of physicians can affect medical care by reducing the various time costs (travel, waiting, appointment) to patients. Physicians in relatively oversupplied locations may inflate demand by using their discretionary powers to recommend more and possibly unnecessary care to their patients. The appropriateness of including both demand and supply variables in the regression equations is based on the argument that demand for health care can be supply-induced.

The regression results show that OHIP families in the excess supply stratum - locations which have relatively greater quantities of physician and hospital beds - do receive more medical benefits than those in the other strata. The differences between the strata are not significant however; unexpectedly, the average benefits per family in the inadequate stratum is somewhat greater than the average benefits for families in the adequate stratum.

Using the same set of independent variables, but with services per family as the dependent variable, the results are similar to those obtained for the medical benefits equations (see equation 11 (Table 28) for example). The difference in services per family between the inadequate and the adequate strata is small. However, the coefficient of the EXSS stratum is positive and highly significant. Indeed, only when services per family is the dependent variable is the availability of health care resources a significant variable.

When physician encounters per family is used as the dependent variable, the coefficients conform fully to expectations i.e. average encounters per family are lowest in

the inadequate stratum and highest in the excess stratum (this can be seen in equation 12 in Table 29 and in equation 13 in Table 30). While the services and average benefits per family in the inadequate stratum are somewhat higher than the average benefits for families in the adequate stratum, the reverse is true when considering physician encounters. These findings are not necessarily inconsistent; they can be explained or reconciled if the services per encounter and costs per encounter are on the average higher in the inadequate than the adequate stratum.

Some possible explanations for the findings are suggested as follows. First, it may be that people in the inadequately supplied areas delay seeking medical care to the point when a physician encounter does occur more and costlier services are needed. A recent study examining the inequality in the medical services received by individuals in Ontario by Hewitt and Milner (1975) supports this hypothesis. The two 'northern groups' and the 'four southern groups' referred to in the following quotation are comparable groups, with a low and a higher ratio of physicians to total population respectively. Hewitt and Milner

> judged that there is prima facie evidence of severity whenever a doctor, rather than receive an adult male patient in his office, sees him in a hospital or (especially) goes to the patient's home. By each of these crude indices of severity, the data proved to give support to our hypothesis. On comparing the six worker groups with respect to percentage of care received in the hospital, we found that the two northern groups ranked first and second, averaging 34.80 per cent on a dollar value basis, while the four southern groups occupied ranks 3 through 6 with an average of 25.98 per cent (standard error of difference between mean = $\pm$1.46, t = 6.04 with 4 degrees of freedom, P < .01). On comparing the percentage of physician services that were rendered at patient's homes, we again found the northern groups in the two highest ranks, averaging 3.785 per cent while in the four southern groups the corresponding average was only 1.820 per cent (standard error of difference between means = $\pm$ 0.615, t = 3.19 with 4 degrees of freedom, P < .05).

TABLE 30: Encounters per family versus demographic, geographic, and socioeconomic characteristics of the family and travel and waiting time

	Equation 13			
Variable	Adjusted coefficient	Standard error	Partial F	Incremental R^2
INC1	0.31	2.45		
INC2	-2.86	1.87		
INC3	-0.30	-	1.19	0.004
INC4	1.01	1.45		
INC5	.75	1.81		
INC6	3.01	3.02		
FAM1	-7.44	3.04		
FAM2	2.25	3.01	17.99+	0.048
FAM3	5.80	3.24		
FAM4	-9.20	2.65		
FAM5	-0.63	-		
INDQ	-0.76	4.09		
ADEQ	0.05	-	1.42	0.002
EXSS	1.21	1.18		
HAGE1	-1.59	2.37		
HAGE2	-0.11	2.46	8.55+	0.017
HAGE3	4.89	2.28		
HAGE4	-3.51	-		
SEDU1	-3.48	3.03		
SEDU2	2.39	-	4.87+	0.013
SEDU3	1.67	1.93		
SEDU4	5.41	2.65		
REMP1	-1.34	-		
REMP2	-1.14	2.57	3.05*	0.006
REMP3	8.87	2.49		
REMP4	-1.49	2.95		

TABLE 30: (continued)

	Equation 13			
Variable	Adjusted coefficient	Standard error	Partial F	Incremental R^2
WAIT1	3.50	-		
WAIT2	-0.35	1.68		
WAIT3	-1.28	1.62		
WAIT4	-0.17	1.67		
TRAV1	0.88	-		
TRAV2	-0.12	1.35	1.00	0.002
TRAV3	-1.20	1.55		
TRAV4	-1.40	2.32		
Constant	18.93	4.31		

R^2 = 0.164, Regression F = 9.14

* significance level of 0.05
\+ significance level of 0.01

Secondly, physician billings in the inadequate stratum may include detention fees more frequently than in the other strata. A detention fee may be charged according to a specified formula when the physician is required to spend considerable extra time on behalf of the patient and to the exclusion of all other work. A detention fee of $6 per quarter hour or part thereof up to some limit is usually allowed.(18) Thirdly, physicians in the undersupplied locations probably have a higher frequency for billing extra fee chargeable for services rendered at nights, Sundays, and statutory holidays(19) relative to those in other locations where there are not only more doctors (and hence services can be more readily obtained in the regular hours) but also a greater supply of out-patient and emergency facilities as well. On the other hand benefits in the adequate stratum can be larger because a greater proportion of the care may be provided by specialists, care which is typically presumed to be more sophisticated and certainly more expensive. Unfortunately the data assembled for the present study are not detailed enough to evaluate the reasons for the higher costs in the inadequate stratum.

Only in the case of services per family was the supply of health care resources found to be statistically significant. A number of studies, however, have shown a significant difference in the utilization of medical services in terms of the supply of physicians per capita (Holahan, 1975) or of proxy variables such as urban/rural residence or urbanization. It may well be that the variables used in this study to reflect the availability of physicians and hospital beds are much too aggregative (because of a lack of data and the relatively small size of the sample, as explained in appendix D) to reflect adequately the significance of the supply factor.

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18 See item 16 of the Preamble to the Schedule of Fees, 1 May 1974 (Ontario Medical Association, 1974, 3).

19 See item 1 (d) of the Preamble (Ontario Medical Association, 1974, 2).

Regular doctor

Whether or not people have a regular physician - general practitioner or specialist - may influence whether or not they seek care. For instance a regular doctor may mean a fewer number of days to make an appointment, while a regular source of care can also mean greater continuity and hence a greater volume of care (Aday and Andersen, 1975). The regression results show it to be a significant variable and that those with a regular physician receive significantly greater medical care benefits than those without. The relationship between a regular source of care and high medical utilization is most probably one of cause and effect, that is, the sick will normally find a regular physician to visit, and those with a regular physician will normally receive more care.

Time variables

A growing theoretical and empirical literature supports the view that the time individuals spend acquiring medical services is an important determinant of utilization.(20) In some instances, of course, the time price is explicitly reflected in loss of earnings, the significance of which is underscored by the extensive development of sick-leave provisions. In other cases the time price is paid by individuals in forgone opportunities to pursue activities of considerable value to them, albeit not income-producing activities.

A number of empirical studies have shown that the spatial-temporal accessibility of consumers to health facilities and services in terms of travel distance and travel time acts as a price in discouraging the demand for medical services.(21)

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20 See for example Holtmann (1970). For a general analysis of the role of time in the theory of consumer choice see Becker (1965).

21 One of the better known studies is that of Acton (1975). See also Weiss and Greenlick (1970).

Similarly, waiting time at the health facility or doctor's office also affects demand to a considerable extent. For instance, Acton (1973) found that a 30 per cent increase in waiting time meant an estimated 10 per cent decrease in the demand for ambulatory care.

Several different time variables were examined in the regression analysis. As shown in equation 9 (Table 25) the average medical benefits are higher for those who wait a shorter number of days for an appointment (APPOl). The difference between APPOl and APPOl0 is small, however, and not statistically significant. The variable is relatively unimportant, with an incremental R^2 of only 0.001.

The dummy variables DISTl and DISTl0 (distance in miles from physician's office) and TRAVl, TRAV2, TRAV3, and TRAV4 (travel time to physician's office) were examined in turn. The coefficient on the DISTl variable was positive, but the result was statistically insignificant. The results also show that while average medical benefits diminish as travel time increases, the differences are small and not significant. The insignificance of these variables perhaps suggests that people have 'accommodated' themselves in terms of travel distance and travel time to a physician's office. Though people may have come to terms with the medical system in terms of travel time or distance, waiting time at a physician's office still seems to act as a 'time price' variable. In equation 9 (Table 25), for example, it can be seen that waiting time is significant in determining the utilization. Except for WAIT4, the average medical benefits decrease with an increase in waiting time. Futherthermore, the coefficient of WAITl is significantly different from the coefficient of WAIT3 at the 0.01 level of significance. Essentially the same results are obtained in equations in which the dependent variable is specified as services per family.

No explanation is offered as to why WAIT4 is positive and larger than WAIT3 and WAIT2. The differences between them, however, are not significant. When encounters per family are used as the dependent variable, WAIT4 is negative but still

larger than WAIT2 and WAIT3, although again they are not significantly different (see equation 13, Table 30). However, in this case WAIT1 is significantly greater than each of the other WAIT variables.

Interaction variables

Perhaps the most important source of bias in this study is the failure to take specifice account of variables that are correlated both with the dependent variable(s) and with one or more of the independent variables; REMP is an illustration of this problem of hidden correlation. Another source of bias, though less serious, is that of hidden interactions among the independent variables. For example, it can be argued that the value of time varies between population groups. Time price can be made commensurate with dollar price by transforming the amount of time by a value per unit of time. For instance it is usually suggested that for employed persons the value of time be the wage rate. The lack of such data prohibits such a transformation, however. Moreover, it is not at all clear what value per unit of time should be used for other groups such as students, retired persons, housewives, and the unemployed. Because of the difficulty of converting time into money, interaction terms are used as proxy variables to reflect the different value of time to the different population groups defined in terms of their labour force status. It is assumed that fully and self-employed persons value time more than other groups, hence the interaction dummy variables WTMP3, WTMP30, and WTMP0 (between waiting time and employment status) and TTMP4, TTMP40, and TTMP0 (between travel time and employment status) are used as defined above.

Arguably, also, families with children behave differently in utilizing medical care depending on the level of family income. A family of five in INC2 may consume fewer medical services, because of the indirect cost of obtaining medical care, compared to the same-sized family in INC5. In the regression analysis family size and income are additive

variables: as family size increases the average medical benefits per family increase, regardless of income. Thus, under the assumption of additivity the following interpretation of the regression equation is permissible: that the difference in the average family medical benefits for a family of a given size (FAM3 for instance) between INC2 and INC5 is simply the difference between the coefficients of INC2 and INC5. One could have chosen any other income classes because in all the regression equations INC2 is less than INC5. The basic idea behind the concept of interaction between variables can thus be put in the form of a hypothesis: a combination of FAM3 and INC2 (i.e. families of five or more persons with family income of $4,000 to $7,999) would receive even less care relative to the families of the same size (FAM3) of higher incomes (say INC5) than that implied by the difference between INC5 and INC2 derived from an equation based on the assumption of additivity. Similarly, it could be hypothesized that the difference in care consumption by families whose heads are sixty-five and over between INC1 and INC5 is greater than that implied by the difference between the coefficients of INC1 and INC5.

However, because of the relatively small sample size and also (importantly) because of the sample composition, finer interaction variables than FMIN1, FMIN10, FMIN0, INAG2, INAG20, and INAG0 were not available. It would be preferable to take specific family sizes in relation to the various income classes, rather than all families with children below and above average income, as the two dummy interaction variables. And it would be interesting to know how the fully employed or self-employed 'behave' in terms of the four waiting time or travel time variables, i.e. if we combined REMP1 with each of WAIT1, WAIT2, WAIT3, and WAIT4 and with the TRAV variables. The difficulty faced in constructing these finer interaction terms is that in many cases the total number of observations for particular terms becomes very small (for example, those families whose head is sixty-five or over and with incomes in excess of $20,000). Thus the construction of much more aggregative interaction variables is forced, and there is a

problem of intercorrelation among the interaction terms and the basic variables used in constructing the interaction variables.

The regression analysis showed that the interaction terms defined above are quite insignificant. Each set had very low incremental R^2, and adding each of the set of dummy variables FMIN1, FMIN10 and FMIN0, or INAG2, INAG20, and INAG0, or both sets together, to equation 7 barely raised the R^2 at all. the results conform to expectation in terms of relative magnitudes - the coefficient of FMIN1 is somewhat greater than FMIN10 and that of INAG2 is greater than INAG20 - the t-value of the differences between them is very small (less than 1). Similarly, WTMP3 is greater than WTMP30, and surprisingly TTMP4 is smaller than TTMP40. In both cases the t-values for the differences between the coefficients are less than one. More important, however, is that the introduction of these interaction terms hardly changed the basic benefit incidence results shown in Table 27.

It would appear, therefore, that the assumption of additivity, which is very common in demand analysis of medical care, is not unduly restrictive in this instance.

Incidentally, the low R^2 found for most equations is generally expected for cross-section micro-data analysis. It also reflects the random nature of morbidity, that is, persons go to physicians usually because of injury, illness, etc. and not because of age, family size, income, etc. in themselves. It has generally been found here that a given set of independent variables specified in the same manner will explain more of the variance of encounters per family than services per family and more of the latter than the public costs per family (compare the values of the R^2 of equations 7, 11, and 12 for example).(22) Since the number of medical services per physician encounter can vary, the services per family can be expected to show a greater variance than encounters per family. Similarly, since the price per medical service can vary

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22 For another example, compare the R^2 of equations 13 and 10 (Tables 30 and 26).

greatly, one can expect medical costs per family to vary more than services per family. Indeed the price per service can vary not only because of different prices for different services but also because higher prices are chargeable for services when rendered by specialists.

The utilization of primary(23) and specialist medical care in terms of encounters, services, and costs per family is summarily presented in Table 31. The composition of use in terms of primary and specialist physicians varies by income class, the higher income groups tending to have a greater volume of specialist encounters and services than other income classes. Indeed, specialist services or encounters as a proportion of total services or encounters increases as income increases. Hence the observation that specialist public cost rises with income class.

The public cost of services is defined to be the dollar benefit accruing to the recipients. Under this definition of benefits a service is valued more when rendered by a specialist than when rendered by a general practitioner. The difference is commonly thought to represent higher quality of care, though whether this is tenable or not is difficult to determine. In any case the data assembled for the study do not permit a revaluation of services on the basis of the type of physician providing them. In particular, the data do not allow the dollar value of services that were in fact provided by specialists at specialists' fees to be devalued to the fees allowed to general practitioners even when these services could be provided by them.

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23 The primary physician category includes general practitioners, pediatricians, and obstetrician-gynecologists. The basic idea was to include all physicians who are often the first point of contact for the patient without referral by other physicians. The specialist category includes a wide range of specialists as well as practitioners. The latter group is small both in number and in terms of the dollar value of services rendered by them. The classification of physicians as primary or specialist is somewhat arbitrary, and analysts are likely to differ on the appropriate grouping.

TABLE 31: Utilization of primary and specialist physician medical care in terms of services, encounters, and costs per family by income class

Variable	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,000	$20,000+
Services					
Primary	17.70	13.88	16.18	16.30	15.50
Specialist	4.78	4.70	5.39	5.97	6.18
Total	22.48	18.58	21.58	22.27	21.68
Encounters					
Primary	14.83	12.03	13.94	14.53	13.76
Specialist	4.48	4.06	4.64	5.37	5.89
Total	19.32	16.09	18.58	19.91	19.65
Public cost					
Primary	119.03	115.85	140.60	154.02	140.81
Specialist	56.73	59.60	70.02	80.14	100.54
Total	175.76	175.55	210.62	234.15	241.35

NOTE: This table summarizes the results of nine separate regression equations. The same independent variables were used in each of the regressions. Three of the nine regressions are reported here in full detail (equation 7, Table 23; equation 11, Table 28; equation 12, Table 29).

SUMMARY CONCLUSIONS

The analysis in this chapter shows that the distribution of medical benefits depends upon how the population unit of analysis (the OHIP family) is defined. If families are grouped only by incomes, which is common in most incidence studies, the results show significantly higher average medical benefits to the higher-income families than to the lower-income families. When the OHIP family is standardized in terms of demographic factors a more even distribution of medical benefits by income class is evident. If further adjustment is made for differences in other socioeconomic factors that might explain the variation in the family medical benefits, further benefit incidence estimates can be derived. Several such distributions were established and are summarized in Table 27 showing a positive relationship between medical benefits and income class. The differences between the estimates of the average medical benefits were not, except in one case, statistically significant.

Besides establishing alternative benefit incidence estimates, another important objective was to point out that a more satisfactory measurement of the effect of income on the utilization of medical care required more than a simple bivariate calculation relating average benefits to family income. The fundamental problem in estimating the effect of income is to isolate that effect from the effects of other variables.

The variables used in the analysis vary considerably in terms of their importance in explaining the total variance in family medical care benefits. Family size is the most important single factor accounting for the variation in family benefits. The family size variable has the highest incremental R^2 in all the estimated equations. Indeed, adjusting for this factor alone not only reduced the observed differences in family benefits between income groups but also made the remaining observed differences in family benefits statistically insignificant (see equation 2, Table 20).

Next most important is the employment status of the head of household, its variable having the second highest incremental R^2 values. This variable may of course be a proxy for the health status of at least some of the sample population. For example, the head of family who is 'retired or disabled' is more likely to have low income or greater health care needs. A higher proportion of OHIP family heads in the lowest income class where in this employment status.

The third most important variable in accounting for the observed difference in family medical benefits is the educational status of the spouse. Significantly greater benefits were associated with higher levels of education of the spouse; to a lesser extent, the same held true for the educational level of family head.

The age of head of family variable ranked next in importance. Family medical benefits generally increased with the age of the head of the OHIP family. The age variable is not as appropriate an indicator of health status when the population unit of analysis is the family as when it is the individual.

Family income ranks fifth in importance in all the equations in which the other variables mentioned above appear. The differences between the average medical benefits by income class established in equations in which these five and other variables were included were not statistically significant except for one instance noted in equation 9 (Table 25). By contrast, the differences between the average family benefits by family size, by age of the head of family, by the educational status of the spouse, and by the employment status of the family head are statistically significant.

The effect of such indirect costs as transportation, loss of earnings, and drugs and medical appliances on the utilization of medical care could not be examined because of difficulties with the survey data.

There were insignificant differences in the average medical benefits between families living in locations differentiated by availability of medical care resources.

Similarly, a number of distance and time variables were examined to see of they would explain the variation in family medical benefits, but these appeared relatively unimportant determinants of medical care utilization and average medical benefits received by families.

Persons who have a regular doctor, i.e. a personal physician, received significantly greater medical care benefits than those without, but no attempt was made to ascertain the nature of cause and effect.

Finally, one reason for the greater average benefits for the higher income classes was the fact that the higher income families received a greater proportion of their physician encounters and services from specialists than did the lower income groups.

Chapter 6

Concluding remarks

THE MAJOR FINDINGS RESTATED

1. There are significant variations in the average dollar benefits and physician services received by OHIP families from the medical insurance program in Ontario. Excluding the lowest income class, there is a distinct positive relationship between family medical benefits and family income. Estimates presented in chapter 4 show the following average family benefits by income class: $159.31 ($0 - 3,999), 145.93 ($4,000 - 7,999), $202.07 ($8.000 - 13,999), $257.01 ($14,000 - 19,999), and $253.69 ($20,000+). The global average family benefits for the sample population were $215.94. Chapters 4 and 5 showed that the observed pro-rich bias in the distribution of medical benefits can be explained by a number of sociodemographic variables, such as the average size of the OHIP families and their age and sex composition. The observed distribution of benefits is also due partly to differences in the average cost of services received by persons in different income classes.

2. The difference in the average size of OHIP families in the various income classes is the single most important factor accounting for the distribution of benefits. Per capita, utilization and medical benefits decrease as income increases. Of course it is not surprising to discover that medical benefits increase with family size. In per capita use of medical services by family size, the single person family is the greatest user and beneficiary of the medical insurance program, while the incremental medical costs of an additional person in the family declines as family size increases.

3. There is a positive relationship between age and

utilization of medical care. The higher benefits of the lowest income group relative to those in the next higher income class is due to the fact that a greater proportion of persons in the lowest income group were over 65 years of age.

4. Females, on average, are higher users of physician services than males. The proportion of married females in their fertility years is greatest in the middle and upper income groups, a fact which contributes to the higher average benefits enjoyed by families in those groups.

5. With the exception of the lowest income group, medical use and benefits for children show a positive relationship with family income class. There is also a significant difference in the average costliness of the services received by children in the different income groups, costs being highest for children in the highest income class.

6. Indeed, for the population generally, the cost per physician encounter and/or service increases with income class. The higher income groups tend to have a greater volume of specialist encounters and services than other income classes.

7. The poorest families receive a significantly greater proportion of their physician services in hospitals than do other income groups. There appears to be a positive relationship between physician services and income class for services rendered in physicians' offices.

8. It was expected that OHIP families in locations where hospital facilities and/or physicians were relatively scarce would have lower levels of utilization and benefits than those in localities with an adequate or an excess supply of health care resources. Yet on an OHIP family basis no significant differences in use or benefits were found. On a per capita basis, however, persons in the 'excess supply' areas did receive significantly more services and benefits than those in the adequately and inadequately supplied areas. The difference was most pronounced for specialist services.

9. The higher the educational level of the spouse, the greater are average family medical benefits. This is also true for the educational status of the family head but to a lesser

degree. This is probably due to the fact it is the spouse who is usually responsible for the health of the family, especially her own and the children's.

10. The present study lacked health status data. It was suggested that employment status of the family head may serve as a crude proxy for health status for at least some of the sample population. A higher proportion of OHIP family heads in the lowest income class were 'retired or disabled' thus thought to have greater health care needs. This factor was found to account for a considerably larger proportion of the physician utilization by the lowest income groups than by the other income classes.

11. Factors such as distance to physician's office, travel time, waiting time in physician's office, and days waited for appointment were not significant in explaining the variation in medical care utilization and benefits received by the different income groups.

12. Finally, chapter 5 showed that the family income variable is not an important factor in accounting for the differences in family medical benefits.

INTERPRETING THE RESULTS

The benefit incidence estimates presented in this study must be properly interpreted, quite apart from the technical and analytical difficulties involved in establishing them. The major issues of interpretation will now be discussed.

This analysis of public medical and hospital insurance programs estimated gross benefits, not net benefits. No attempt has been made to consider the costs (through premiums and taxes) to the various population groups. As discussed in chapter 1, to do so would have involved a balanced budget incidence analysis. Nor should the estimates produced here be regarded as indicating what the net loss would be to the various groups if these programs were somehow (quite unrealistically) eliminated.

Estimates of the incidence of government expenditure

Based on 1974 data!

programs by income size groups inevitably raise questions of equity, notwithstanding the fact that there are no explicit standards of progressivity. A tax system is said to be progressive if the taxes paid by higher income groups are a higher proportion of their incomes than those paid by lower income groups. The 'effective expenditure rates' by income class routinely reported in fiscal incidence studies divide the expenditure received by families in the various income classes by the total income in each class. In the present study, such effective incidence rates may be approximated by dividing the average benefit per family in each income class by the average family income in that class, taking the latter to be represented by the midpoints of the income brackets. For the open-ended income bracket of $20,000+, assume that the midpoint is at least $22,500. (This is a conservative estimate of course, but the higher it really is the stronger the point.) It can then be seen that no matter how one defines or standardizes the family unit (i.e. no matter which of the many equations one uses, even those that show that benefits increases with income class), the effective incidence rates will diminish as the income rises.

In expenditure or benefit incidence analysis 'progressive' and 'regressive' need not mean what they do in tax incidence studies. What matters, in a sense, are not the benefits of these expenditure programs as a proportion of income but only their absolute values. In expenditure incidence the presumption can be made that various income groups have equal or near-equal need for the services of the programs, whereas in tax incidence people in different income classes are presumed to have different abilities to pay the various taxes imposed on them.

With this interpretation, and since we are considering only gross benefits, the equity of the distribution of medical benefits depends upon one's view of the population unit of analysis and its defining characteristics. The benefit incidence estimates derived from the first two equations and the evaluation of the statistical significance of the

differences between them (see Table 27) imply a distinctly regressive pattern of distribution, that is, a significant pro-rich bias in the distribution of medical benefits.(1) On the other hand estimates derived from equations 3 to 6 inclusive suggest a quite even distribution of benefits. The other equations suggest that average benefits increase with income throughout the income range, though the differences between the values were not statistically significant. None of the equations suggest that the distribution is progressive throughout the income range.

Equity viewed simply in terms of income size class may not be an issue, at least not one as significant as equity defined other ways. For instance, what matters may be the distribution of benefits according to the health care needs of the population, and we saw, on the basis of a very crude proxy indicator of health status, that those with greater needs do receive significantly greater medical benefits.

Perhaps more importantly, equity should be viewed in terms of a combination of health care needs and income: given the same needs, do people with different incomes receive equal amounts of care (benefits)? The regression analysis with proxy health status variables suggests that the distribution of the average medical benefits may be regressive. Of course one's confidence in these results depends on one's opinion of the proxy variables. It is at least clear that future research into the distribution of health services should pay particular attention to establishing acceptable health status measures. To this end the diagnostic information in the OHIP medical and hospital utilization files will be useful, but sources independent of the health care utilization files are of course also advisable.

Since there is no similar study of the utilization or distribution of medical services in Ontario for a period before

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1 Whether one judges a progressive distribution to be equitable or inequitable naturally involves a value judgment.

the introduction of medicare, we cannot tell how that program has altered the distribution of services or reduced the effect of income on the demand for medical services. As we saw in chapter 2 it is generally believed that before medicare the distribution of medical services was positively related to socioeconomic status and that income was an important factor in demand. Since under medicare income is found not to be an important factor in determining medical care use we might reasonably conclude that a reduction in importance of the income effect has occurred. An improvement in the distribution of care as well has probably followed the inception of the public insurance program, although whether or not the current distribution of medical care is acceptable remains a matter of opinion.

A close comparison of Beck's and Enterline's studies with the present one is not possible. As should be evident from chapters 2 and 3, the studies differ in time period, method of establishing the data base, measures of utilization, and analytical techniques. Nevertheless, roughly speaking the present study provides general support for Beck's findings.

SUGGESTIONS FOR FURTHER RESEARCH

In view of the reservations outlined above, how useful are these estimates? First, they give an idea of the probable distributional impact of public medical insurance programs, without which decision-makers would have to rely on qualitative judgments, intuition, or inferences based on various assumptions about the pattern of benefit incidence. Secondly, a number of the conceptual, technical, and informational problems encountered in this study may be resolved in the course of future research. For example, when more meaningful hospital cost data replace the present per diem rates a hospital benefit incidence analysis can be attempted. Then again, a longitudinal panel study could help resolve a number of problems that face any static analysis of public expenditure

programs.(2) A more detailed and comprehensive measurement of family income is yet another area for improvement. And so on. Thirdly, there is a growing need for micro-incidence studies and a shift in emphasis away from general studies of global budget incidence towards studies of the distributional implications of specific policy measures or programs. As de Wulf (1974,26) has argued:

> When a certain income distribution is considered unsatisfactory one need not completely overhaul the revenue and/or expenditure system to provide a more satisfactory income distribution. Short of a social revolution, such an overhaul would be politically and administratively impossible. Even total abolition of the income taxes or customs duties is rarely considered, let alone the abolition of defense spending or public education. Rather than such drastic changes, most policy decisions are concerned with the relative expansion of different revenue sources, and the spending of additonal revenues on alternative projects. Public policy decisions are thus on the whole marginal, pertaining to relatively small tax or expenditure changes. Incidence studies can make a valuable contribution with regard to the income distributional implications of the policy measures.

The benefit incidence and the utilization estimates generated in the present study, together with a 'determinants of use' analysis, can significantly assist consideration of public policies in the health field. A simulation model could be constructed to evaluate patient cost-sharing proposals in Ontario. The Ontario Economic Council recently suggested introducing the partial financing of health costs by patients through the tax system in Ontario. The major dimensions of the proposal include deductibles, coinsurance rates, and maximum or catastrophe cost limits, all of which may be related to ability-to-pay criteria.(3) A number of alternative

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2 A panel study can be attempted by the Ministry of Health without conducting a household survey. Many independent variables such as sex are constant over time, age and family size can be updated annually, education and occupational data do not change for many people. The major problem with the suggested OHIP follow-up through its own information systems is that some data such as incomes will change over time.

3 Ontario Economic Council (1976, appendix B) contains a brief description of the proposal.

cost-sharing schemes have also been suggested in a recent provincial government report, including, among other proposals, a user charge of $2.00 per physician visit, an increase in daily charges for private and semi-private accommodation in hospitals, direct charges of $5 to patients for services in emergency departments, out-patient visits, and hospital in-patient care, and rebates of medical and hospital insurance premiums in recognition of low use of health services.(4)

Two preliminary steps seem necessary before a simulation study can be most profitable. First, the three microdata files should be merged on a person-by-person basis, so that for each person in the sample the entire set of independent variables and utilization variables are merged.(5) An analysis of the utilization or benefits can then be performed per capita rather than per family or per person per family. A person-by-person microdata file allows a less complicated, more flexible, and more meaningful specification in multivariate analysis of such variables as age, sex, and health status. The second preliminary step concerns health status information. The independent variables available for use in this study included age, marital status, family size, income, availability or otherwise of a regular physician, availability of health care resources, waiting time at doctor's office, distance from physician and/or hospital, occupational status, labour force status, education, and so on. But some important variables were missing. Health status is an important determinant of health care utilization, and several recent studies have shown that health status variables explain a large proportion of the variance in utilization. Could the Ministry of Health be persuaded to generate a health status index for each of the

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4 These proposals can be found in chapter 8 of the The Report of the Special Program Review (Government of Ontario, 1975).

5 Persons in a given OHIP family are uniquely identified in terms of age and sex only. Some errors between the three files are inevitable. Through some rules of thumb, or in technical jargon through error functions, a person in any file could be matched with a person in the other files.

sample individuals from the diagnostic data available to it?

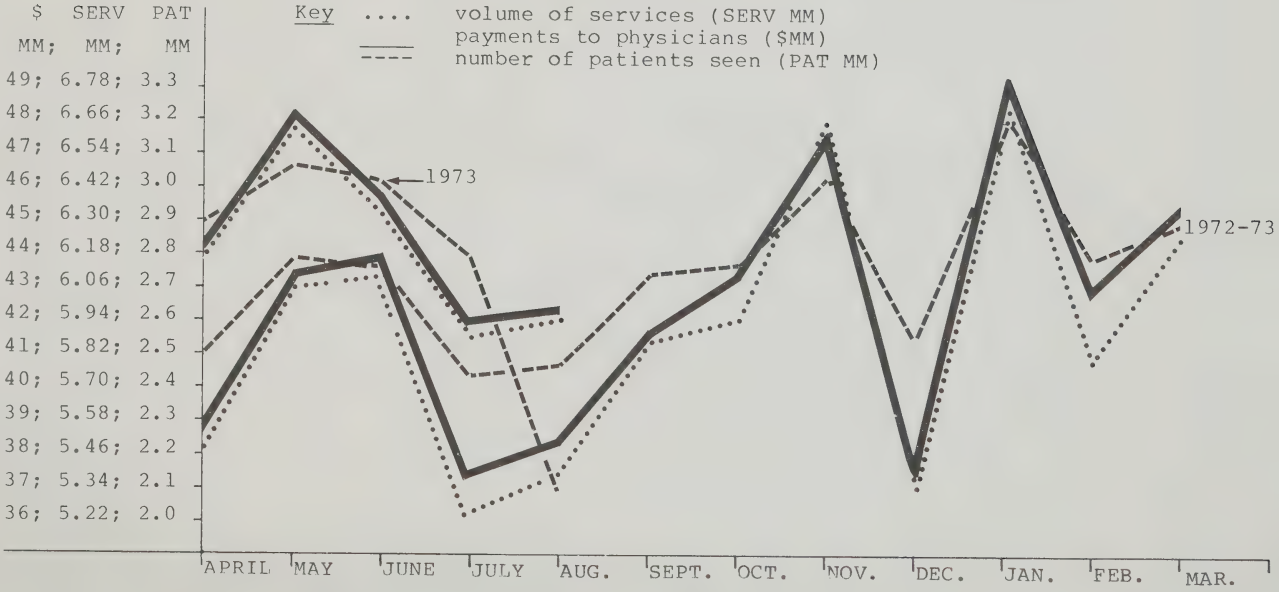
The benefit and utilization estimates of the study suggested above can constitute the major ingredients of the simulation model, though some of its elements are necessarily extraneous (such as estimates of the price elasticity of demand). Such a simulation model could prove useful in evaluating the probable effects of patient cost-sharing and similar proposals. Without such a model the government could not readily estimate the revenue implications of various recent cost-sharing plans, an important exercise, especially if these plans were being considered to replace the present OHIP premium system. Cost-sharing may prove not worth the net revenue potential, i.e gross revenue minus a variety of transaction and administrative costs implied by their adoption as well as premium revenue (if premiums are abolished). This is only one aspect of the proposal, of course, but it is likely to be a major issue in deciding the ultimate feasibility of cost-sharing schemes. The other major consideration is the distribution among various income groups of the (tax) burden implied by these plans. Here too, the simulation model is needed.

Appendix A

THE PATTERN OF SEASONALITY IN THE UTILIZATION OF MEDICAL SERVICES IN ONTARIO

The basic pattern of seasonality in the utilization of medical services is shown in Figure A1, covering a period from April 1972 to August 1973. A similar figure can be drawn for each type of physician. The physician types are defined as general practitioners, general surgeons, obstetricians and gynecologists, orthopaedic surgeons, urologists, plastic surgeons, neurologists, ophthalmologists, podiatrists, chiropractors, thoracic surgeons, dermatologists, pathologists, osteopaths, dental surgeons, oral surgeons, psychiatrists, physiatrists, and therapeutic radiologists. The pattern of seasonality for these specialties has the following characteristics: The month of December is invariably a local trough (low). The other local low month of utilization is either July or August. Depending on specialty, the December figures may be lower, higher, or the same as that of July or August figures. There are also many similarities in the pattern of local peaks of utilization by specialty. The local peaks of service are in January or February, in October or November, and in May or June, depending on specialty. The amplitude or the fluctuations about the mean figures appear to vary by specialty; no study of this aspect has yet been attempted.

FIGURE A1: Seasonal variation in medical care utilization in Ontario
(Note: the same patient seen three times is counted as three patients.)



Appendix B

TABLE B1: Average utilization and costs of medical services of all children from 0 to 21 years in age per family by income class

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Services	11.99	6.43	12.27	12.90	13.72	17.80	2.28†
Visits	9.02	4.11	6.97	8.65	7.83	12.26	2.78+
Prim Enc	7.29	4.00	8.85	9.53	10.29	12.95	2.60†
Spec Enc	3.84	1.62	2.37	2.14	2.47	3.80	0.96
Encounters	11.14	5.62	11.22	11.67	12.76	16.75	2.53†
Serv/Enc	0.86	0.79	1.09	1.11	0.96	1.06	5.79*
Costs ($)							
PC, Visits	73.48	33.64	52.78	68.49	67.91	127.61	4.41*
PC, Prim	72.12	32.36	61.68	76.46	74.24	91.98	2.85+

TABLE B1: (continued)

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
PC, Spec	65.02	18.59	24.90	32.23	49.61	72.92	3.36*
PC	137.14	50.95	86.58	108.69	123.86	164.90	4.12*
PC/Service	7.77	6.22	7.34	8.56	10.43	8.03	3.53*
PC/Visit	6.35	5.58	8.52	8.40	7.78	7.80	4.21*
PC/Prim	7.61	4.91	7.83	7.21	7.94	6.96	1.38
PC/Spec	11.22	6.15	7.73	12.02	13.97	13.59	2.55†
PC/Enc	8.22	6.75	8.42	9.39	10.89	8.48	2.82+
N(weighted)	15	43	148	186	99	15	Σ = 505
N(observed)	37	54	183	194	217	15	Σ = 700

* significance level of 0.01
\+ significance level of 0.05
† significance level of 0.10

NOTE: Degrees of freedom: between 5, within 694. N is the number of families with children aged 0 to 21 years in income class.

TABLE B2: Average utilization and costs of medical services per child per family by family income class

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F- statistic
Services	4.88	2.17	4.12	4.00	4.22	5.62	1.61
Visits	3.60	1.38	2.34	2.58	2.51	4.01	2.05
Prim Enc	3.31	1.36	3.13	2.94	3.09	3.91	1.59
Spec Enc	1.24	0.58	0.64	0.63	0.84	1.40	1.73
Encounters	4.55	1.94	3.77	3.57	3.93	5.32	1.81
Costs ($)							
PC, Prim	32.70	11.41	21.36	24.39	22.40	28.17	1.97
PC, Spec	26.67	6.44	6.96	9.20	17.10	30.99	4.62*
PC	59.37	17.86	28.31	33.60	39.50	59.15	3.97*
N(weighted)	15	43	148	186	99	15	Σ = 505
N(observed)	37	54	183	194	217	15	Σ = 700

NOTE: See note to Table B1.

TABLE B3: Average utilization and costs of medical services per male adult of 22 to 40 years of age by income class

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Services	0.94	8.64	6.64	7.55	5.22	6.04	1.89
Visits	0.51	4.08	3.32	3.38	2.60	4.04	1.65
Prim Enc	0.50	4.61	3.74	3.78	3.52	5.26	1.10
Spec Enc	0.33	1.03	1.49	1.88	1.11	0.41	2.06
Encounters	0.83	5.64	5.22	5.66	4.63	5.68	1.08
Serv/Enc	0.24	0.97	0.89	1.21	0.92	0.83	3.03*
Costs ($)							
PC, Visits	3.25	29.08	27.37	30.85	27.92	71.76	3.47*
PC, Prim	2.08	38.61	27.38	31.61	43.96	77.51	5.00*
PC, Spec	2.59	9.30	29.96	54.43	18.45	9.75	6.23*

Table B3: (continued)

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F- statistic
PC	4.66	47.92	57.34	86.04	62.41	87.26	3.39*
PC/Service	0.97	5.94	6.32	11.27	13.44	9.17	5.16*
PC/Visit	0.97	3.96	5.85	7.17	8.18	9.68	7.09*
PC/Prim	1.05	6.89	5.18	7.23	11.76	9.18	4.25*
PC/Spec	1.30	3.19	12.12	17.12	9.21	7.89	2.98+
PC/Enc	1.19	7.00	7.59	13.43	13.99	9.32	5.20*
N(weighted)	6	24	187	163	87	12	Σ = 479
N(observed)	11	22	112	129	121	18	Σ = 413

* significance level of 0.01
\+ significance level of 0.05

NOTE: Degrees of freedom: between 5, within 407. N is the number of families with males between 22 to 40 years in age by income class. Since an OHIP family can have only one male adult the results are identical on a 'per person per family' and on a 'per family' basis.

TABLE B4: Average utilization and costs of medical services per female adult of 22 to 40 years of age by income class

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F- statistic
Services	6.33	2.99	8.22	10.15	9.15	8.78	4.86*
Visits	3.38	1.54	4.44	5.34	4.38	3.69	3.53*
Prim Enc	4.11	1.91	5.34	6.20	5.39	5.23	4.43*
Spec Enc	0.90	0.52	1.38	2.47	1.86	2.07	4.85*
Encounters	5.00	2.43	6.72	8.67	7.25	7.30	5.26*
Serv/Enc	0.88	0.86	1.07	1.05	1.32	1.13	5.18*
Costs ($)							
PC, Visits	23.94	11.48	37.36	51.88	43.18	28.41	2.43
PC, Prim	35.36	17.26	75.17	76.33	68.89	71.83	3.78*
PC, Spec	8.56	6.00	30.23	44.21	30.78	53.25	3.74*
PC	43.82	23.26	105.40	120.54	99.26	125.08	5.24*
N(weighted)	19	62	148	173	96	13	Σ = 510
N(observed)	25	33	124	137	148	25	Σ = 492

* significance level of 0.01

NOTE: Degrees of freedom: between 5, within 486. N is the number of families with females between 22 to 40 years of age by income class. It should be noted that since an OHIP family can have only one female adult, the results are identical on a 'per person per family' and on a 'per family' basis.

TABLE B5: Average utilization and costs of medical services of adults between 40 and 65 years of age per family by income class

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F- statistic
Services	20.07	13.57	14.79	11.30	12.33	21.05	2.20
Visits	12.65	8.64	8.12	5.36	5.94	8.67	3.18+
Prim Enc	14.75	9.69	7.98	7.33	6.61	8.70	3.19+
Spec Enc	2.50	2.26	8.83	2.24	3.67	7.24	2.74+
Encounters	17.26	11.95	11.82	9.57	10.28	15.93	2.03
Serv/Enc	0.85	1.00	0.89	0.69	0.85	0.82	3.90*
Costs ($)							
PC, Visits	86.89	61.95	68.94	44.10	59.53	110.83	2.31
PC, Prim	114.81	90.51	74.94	60.72	62.99	75.28	2.21
PC, Spec	97.75	43.91	50.51	43.30	65.50	154.08	4.39*

TABLE B5: (continued)

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F- statistic
PC	212.56	134.42	125.46	104.02	128.49	229.36	3.15+
PC/Service	8.63	9.07	6.52	6.10	8.12	6.37	2.81+
PC/Visit	6.25	6.45	5.24	5.00	7.05	7.31	4.17*
PC/Prim	7.53	9.10	7.41	5.39	7.32	5.98	2.60
PC/Spec	16.94	12.20	8.57	8.63	14.15	11.54	3.85*
PC/Enc	9.92	10.51	7.81	6.73	9.51	7.82	3.37*
N(weighted)	40	61	196	209	127	24	Σ = 657
N(observed)	53	63	139	138	187	44	Σ = 624

* significance level of 0.01
\+ significance level of 0.05

NOTE: Degrees of freedom: between 5, within 618. N is the number of families with adults between 40 to 65 years in age, by income class.

TABLE B6: Average utilization and costs of medical services per adult between 40 and 65 years of age by income class

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Services	14.32	9.68	11.06	7.78	8.77	16.30	2.64
Visits	9.01	6.24	6.09	3.83	4.40	6.38	3.08+
Prim Enc	10.29	7.01	5.89	5.03	4.54	6.59	3.09+
Spec Enc	2.07	1.43	2.98	1.72	2.82	5.25	2.89+
Encounters	12.36	8.44	8.87	6.75	7.37	11.84	2.07
Costs ($)							
PC, Prim	86.67	73.13	55.46	41.12	46.51	53.53	2.67
PC, Spec	71.54	27.89	40.72	33.12	50.23	116.72	4.59*
PC	158.21	101.01	96.18	74.24	96.74	170.25	3.13+
N(weighted)	40	61	196	209	127	24	Σ = 657
N(observed)	53	63	139	138	187	44	Σ = 624

NOTE: See note to Table B5.

TABLE B7: Average utilization and costs of medical services for adults aged 65 years or more per family by income class

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Services	13.13	16.53	11.80	13.73	35.99	17.37	1.47
Visits	10.91	8.91	6.16	10.96	25.39	9.71	1.28
Prim Enc	10.69	9.09	6.57	9.87	24.64	10.94	1.09
Spec Enc	1.79	3.48	3.07	3.03	8.35	4.17	2.17
Encounters	12.48	12.57	9.65	12.90	32.99	15.11	1.41
Serv/Enc	0.91	1.21	1.06	0.69	1.08	0.97	2.76+
Costs ($)							
PC, Visit	71.27	64.09	55.56	91.79	182.67	88.54	1.45
PC, Prim	66.81	79.12	50.01	74.79	164.65	92.06	1.19
PC, Spec	37.43	87.07	46.30	58.96	142.76	123.52	1.82

TABLE B7: (continued)

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F- statistic
PC	104.24	166.19	96.31	133.75	3.07.41	215.58	2.17
PC/Service	8.22	9.00	9.02	6.06	8.65	9.49	0.25
PC/Visit	6.80	7.41	7.97	7.09	8.33	10.60	1.67
PC/Prim	5.63	7.87	7.49	6.10	7.50	7.05	1.90
PC/Spec	14.75	12.19	10.03	11.33	17.49	21.36	0.78
PC/Enc	8.63	10.76	10.00	6.44	9.39	10.79	0.66
N(weighted)	72	53	25	7	4	15	Σ = 176
N(observed)	89	62	52	24	14	15	Σ = 256

* significance level of 0.05

NOTE: Degrees of freedom: between 5, within 250. N is the number of families with adults aged 65 years or more by income class.

TABLE B8: Average utilization and costs of medical services per adult aged 65 years or more by income class

Items	$0 - 3,999	$4,000- 7,999	$8,000- 13,999	$14,000- 19,999	$20,000+	Unknown	F-statistic
Service	11.11	11.55	7.73	9.41	19.84	12.24	0.89
Visits	8.92	5.40	3.86	7.60	13.46	6.17	1.99
Prim Enc	8.70	5.98	3.93	6.92	13.36	7.80	1.69
Spec Enc	1.76	2.29	2.11	1.95	4.93	2.68	0.77
Encounter	10.46	8.27	6.04	8.88	18.29	10.48	1.49
Costs ($)							
PC, Prim	56.08	51.69	32.28	51.10	90.46	68.96	1.19
PC, Spec	36.59	50.91	32.35	41.94	86.19	81.84	1.09
PC	92.67	102.60	64.63	93.04	176.65	150.79	1.46
N(weighted)	72	53	25	7	4	15	Σ = 176
N(observed)	89	62	52	24	14	15	Σ = 256

NOTE: See note to Table B7.

Appendix C

THE SURVEY QUESTIONNAIRE

EXPLANATORY NOTES ON SELECTED ASPECTS OF THE QUESTIONNAIRE

The screening questions on the facesheet page of the questionnaire are to establish the number of eligible respondents in a household and to enumerate the 'OHIP family' members of the selected respondent. An OHIP family may consist of married persons, single or married persons with unmarried children under 21 who are not working full-time, a single person over 21, or a single person under 21 who is working full-time. Thus persons who answered that they were 22 years of age or more to question A, of 'yes' to question B, or 'married' to question C were either the registrant of the OHIP family or the spouse of registrant, and hence eligible to be a respondent for the interview. Since a household is likely to contain a number of OHIP families and have a number of eligible respondents, a random selection is made of these eligible respondents. Only one OHIP family per household is surveyed.

The screening questions numbered 1a, 1b, 1c, and 1d are to determine the 'validity' of the OHIP number. If the respondent's effective date of insurance coverage stated on the OHIP insurance card is before May 1974 one can be sure that the OHIP number is valid (i.e. continuous coverage by the same OHIP number) over the study period. However, it is possible for persons with a valid insurance number to have their effective date altered upon a change of job, marriage, divorce, separation, becoming twenty-one years of age, or going on or off welfare assistance. The purpose of questions 1b, 1c, and 1d is to screen out as efficiently as possible with an OHIP number not likely to be effective from May 1974 to March 1975.

The health-related questions of the survey are not all designed to serve the interests of the present study. Many of the questions serve other research efforts of the Ontario

Economic Council and are only indirectly or tangentially related to the main concerns of the present study.

Part II of the questionnaire is largely focused on the attitude and knowledge of the respondents to provincial and municipal government taxation and expenditure programs; these questions are not included in this appendix.

Besides the responses to the questionnaire, the completed survey results also include the Blishen score (Blishen, 1958) of the registrant and, wherever applicable, of the spouse. The score is a measure of a person's socioeconomic class constructed on the basis of the individual's stated occupation and a variety of personal characteristics including income and years of schooling. The calculations were made by the Survey Research Centre of the Institute of Behavioural Research, York University.

PROJECT #166

Selection Table #_____

SCREENING

The Survey Research Centre at York University is conducting a study about health services and government spending in Ontario. We are interested in your opinions and you may be assured that all information will be kept strictly confidential.

RELATION TO HEAD OF HOUSEHOLD	SEX	A AGE OF PERSON AT JAN. 1975	B UNDER 22 YEARS & WORKING FULL TIME (YES OR NO)	C MARITAL STATUS	ELIGIBLE? (YES or NO) See Card A	PERSON NUMBER	CHECK SELECTED PERSON
(Head)							

RECORD OF CALLS				
	DAY	MONTH	TIME	COMMENTS
1				
2				
3				
4				
5				

HOUSEHOLD INFORMATION

A. Is selected address

LIVE? ☐ DEAD? ☐

B. No. of households at this selected address? _____

Language of Interview_____

Length of Interview_____

Interviewer:_____

10 20 30 40

50 60 70 80

1. a) Before we begin, could you please give me your OHIP number?

(VERIFY 8-DIGIT NUMBER FROM OHIP CARD)

(INTERVIEWER: RECORD EFFECTIVE DATE: | | | | |

IF APRIL 1974 (ie: 04/74) OR BEFORE APRIL 1974 GO TO Q.2a.

IF AFTER APRIL 1974, ASK:

b) Who is the registrant of this number?

Head of household 1

Spouse. 2

Other 3

c) Has the registrant of this OHIP number been a resident of Ontario since January 1974?

Yes 1

No *(SEE INSTRUCTION AT BOTTOM OF PAGE)*. 2

d) Did the registrant have the same OHIP number for the period April 1974 to March 1975?

Yes 1

DK. 2

→ GO TO Q.2a ←

No. . . . . *(SEE INSTRUCTION BELOW)* 3

(INTERVIEWER: 1) IF THIS IS A ONE-OHIP FAMILY HOUSEHOLD TERMINATE INTERVIEW.

2) IF THERE ARE 2 OR MORE OHIP FAMILIES AT THIS ADDRESS RETURN TO THE HOUSEHOLD LIST AND RENUMBER THE ELIGIBLE RESPONDENTS IN THE REMAINING OHIP FAMILY (OR FAMILIES).

3) RANDOMLY SELECT ANOTHER POSSIBLE RESPONDENT AND REPEAT QUESTIONS STARTING AT Q.1a.

2. a) Did anyone who was covered by this number in April 1974 lose coverage under it by March 1975?

Yes 1

No 2

DK 8

GO TO Q.3a

b) Who lost coverage?		c) When?	d) Why?
Sex	Age	*(RECORD MONTH)*	*(RECORD REASON CODE SEE BELOW)*
___	___	_____	___
___	___	_____	___
___	___	_____	___

"WHY?" CODES FOR Q.2d

Child turned 21 years 1
Child is working. 2
Child is married. 3
Other reason. 4

3. a) Was there anyone covered by this number in March 1975 who was not covered by the number in April 1974?

Yes 1

No *(GO TO Q. 1)* 2

b) Who was not covered?		c) When did person become covered?
Sex	Age	*(RECORD MONTH)*
___	___	_____
___	___	_____
___	___	_____

4. *INTERVIEWER: RETURN TO COVER PAGE. PLACE ASTERISK NEXT TO REGISTRANT AND MEMBERS OF HIS (HER) "OHIP FAMILY" IN THE LEFT HAND COLUMN OF THE HOUSEHOLD LIST.*

THEN ASK:

Are there any other persons covered by this OHIP number who do not reside here?

(RECORD SEX AND AGE)

Sex	Age
___	___
___	___
___	___

5. Almost everybody has basic medical and hospital insurance through OHIP. Do you have extra or other health insurance such as that for...

	No	Yes *(ASK:)* ⟶	Monthly Premium?
...dental care	1	2 ⟶	$_____
...semi-private hospital	1	2 ⟶	$_____
...private hospital.	1	2 ⟶	$_____
...prescription drugs.	1	2 ⟶	$_____
...other (specify) _____	1	2 ⟶	$_____

6. a) *ASK FEMALE RESPONDENT WITH CHILD (CHILDREN) UNDER 5 YEARS - OTHERS GO TO Q.7*

For your (last) child, can you tell me the month (1 - 9) that you first contacted a doctor after becoming pregnant?

month # _____

DK 8

b) Did you consult a...

...general practioner 1

...obstetrician, gynecologist 2

...other (specify)_____ 3

...DK 8

7. a) Do you have a personal physician you could go to for medical care when needed?

Yes, a general practitioner (G.P.). 1

Yes, a specialist 2

Yes, both G.P. and specialist 3

No. 4

DK. 8

IF "YES" FOR SINGLE R., GO TO Q.9
IF "NO" FOR SINGLE R., GO TO Q.8
IF MARRIED ASK:

b) What about your spouse?

Yes, a general practitioner (G.P.). 1

Yes, a specialist 2

Yes, both 3

No. 4

DK. 8

7. c) What about your children?

Yes, a G.P.. 1
Yes, a specialist. 2
Yes, both. 3
No 4
DK 8
INAP (No children). 9

8. *IF "YES" TO ALL OF 7a, b and c, go to Q.9*
IF "NO" TO ANY OF 7a, b or c, ASK:

When you (spouse/children) need to see a doctor, do you (they) usually ... *(CODE R., SPOUSE AND CHILDREN SEPARATELY)*

	R.	Spouse	Children
...go to a hospital clinic, outpatient or emergency department.	1	1	1
...try to find a doctor somewhere.	2	2	2
DK.	8	8	8
INAP.	9	9	9

9. In recalling the last visit to a doctor by any member of your OHIP family, where an appointment was necessary, could you please tell me...

a) ...how long did you have to wait to get an appointment with the doctor? #days_____
DK 98

b) ...how long did it take you to get to the doctor? #minutes_____
DK 98

c) ...how long did you have to wait to see the doctor once you got there? #minutes_____
DK 98

10. How far do you live from...

a) ...your doctor's office #miles__ __ __
INAP . . . 999

b) ...your nearest general hospital #miles__ __ __

11. In recalling the last visit to a doctor, clinic or outpatient department (by any member of your OHIP family)...

a)...did the doctor bill you directly for the visit?

Yes 1
No 2
DK 8

b)...was it difficult to take time off work?

Yes 1
No 2
Not working *(GO TO Q.11d)* 3
DK 8

c)...did you lose any earnings from work because of the visit?

Yes 1
No 2
DK 8
INAP 9

How much? $_____

d)...were there baby-sitting costs?

Yes 1
No 2
DK 8
INAP 9

How much? $_____

e)...what did it cost for transportation to and from the doctor?

$_____
(include costs of using personal car, eg. gas, parking)

f)...was a prescription made for drugs or items such as glasses, hearing aid etc.?

Yes 1
No 2

How much did it cost? $_____

ASK ABOUT ANY MEMBER OF THE OHIP FAMILY:

12.a) Have there been "special" occasions in the last 12 months when it was necessary to make long trips to see a doctor? (that is, out of town or city).

Yes 1
No. 2
DK. 8
→ *(GO TO Q.13a)* ←

b) How many times? _____

RECORD INFORMATION BELOW FOR 3 LONGEST TRIPS ONLY

c) To what city did person travel?	d) #miles? (return)	c) Code doctor as: G.P. 1 or Specialist 2 or Other 3
1)_____	_____	_____
2)_____	_____	_____
3)_____	_____	_____

13. a) Have there been "special" occasions in the last 12 months when it was necessary to make long trips to enter a hospital?

Yes 1
No. 2
DK. 8
→ *(GO TO Q. 14)* ←

b) How many times?_____

RECORD INFORMATION BELOW FOR 3 LONGEST TRIPS

c) To what city did person travel?	d) How many miles (return) is that?
1)_____	_____
2)_____	_____
3)_____	_____

HAND R. CARD B

14. I am going to read a number of statements. Please tell me if you feel very satisfied, satisfied, unsatisfied or very unsatisfied with each one.

Very Satisfied	Satisfied	Neither	Unsatisfied	Very Unsatisfied	DK/No Opinion	INAP
1	2	3	4	5	8	9

a) The number of doctors in your community . . . . . _____

b) The time it takes to make an appointment with a doctor. _____

c) The waiting time in the doctor's office or clinic . . . _____

d) The costs you have to pay yourself to get medical care (excluding premiums). . . . . _____

e) The ease and convenience of getting to a doctor from where you live or work. . . . . _____

f) The amount of time the doctor has with you in the office _____

g) The overall quality of the medical care received. . . . _____

h) The information on medication and the amount of medication the doctor prescribes. . . . . _____

i) The overall quality of hospital care received . . . . . _____

15. When a doctor prescribes medication for the treatment of illness, how often do you buy it...

a)... for adults in your family? *(CODE MALE, FEMALE SEPARATELY)*

b)... what about for children in your family?

Would you say...	a) ADULTS Male	a) ADULTS Female	b) CHILDREN
...always 1	1	1	1
...often . . . . . 2 *(GO TO Q.16)*	2	2	2
...sometimes. 3	3	3	3
...rarely 4	4	4	4
DK *(GO TO Q.16)* 8	8	8	8
INAP 9	9	9	9

c) What is the reason? Is it...

...too expensive. 1

...did not believe drugs would do much good 2

...did not understand why drugs were prescribed 3

...some other reason? 4

DK/No reason 8

INAP 9

16. When you do buy the prescribed medication...

a)...do adults in your family usually take the medication as recommended by your doctor? *(CODE MALE & FEMALE SEPARATELY)*

b)...do the children in your family take the medication as recommended?

Would you say...	a) ADULTS Male	a) ADULTS Female	b) CHILDREN
...always *(GO TO Q.17)*	1	1	1
...often "	2	2	2
...sometimes	3	3	3
...rarely	4	4	4
DK *(GO TO Q.17)*	8	8	8
INAP	9	9	9

c) What is the reason? Do you...

...believe that medication will not be helpful anyway 1

...not really understand how to take the medication, how often or for how long 2

...feel you cannot afford to refill prescription. 3

...other reason 4

DK/No reason 8

17. Do you think that the present OHIP premiums should be...

...raised. 1

...reduced 2

...shouldn't have premiums at all. 3

...kept the same 4

DK/No opinion 8

18. What is your best guess...

a)...on how many doctor visits your "OHIP family" made in the last 12 months?

visits_____

DK 98

b)...on the number of days your "OHIP family" members spent in hospital in the last 12 months?

days_____

DK 98

c)...on the total cost paid by OHIP for medical and hospital care on behalf of your "OHIP family" in the last 12 months?

$_____

DK . . . 9998

19. Would you like to know the cost of medical or hospital care each time you receive services?

Yes. 1

No 2

DK/NO OPINION. 8

20. Dr. Bette Stephenson, the President of the Canadian Medical Association has suggested that government should introduce a flat fee (of say $2. or $3.) to be paid by a patient for each visit to the doctor or each day in hospital over and above the costs paid for by the health insurance plans. Would you like to see such fees introduced in Ontario.?

Yes 1

No. 2

DK. 8

IMPORTANT! *IF R. IS REGISTRANT, CHECK HERE* ☐ *AND CODE Q.10 - 12 UNDER REGISTRANT. REPEAT Q. 10 - 12 FOR SPOUSE.*

IF R. IS NOT REGISTRANT, CHECK HERE ☐ *AND CODE Q.10-12 UNDER SPOUSE. REPEAT Q. 10 - 12 FOR REGISTRANT.*

REMEMBER REGISTRANT = HEAD OF "OHIP FAMILY"

10.a) Is the registrant working at the present time? Is he(she) in his own business, unemployed or something else? *(CODE UNDER 'a' BELOW)*

b) What about spouse of registrant? Is he (she) working? *(CODE UNDER 'b' BELOW)*

	(a) Registrant	(b) Spouse
Self employed.	1	1
Employed full-time	2	2
Employed part-time	3	3
Laid-off temporarily	4	4
Out of a job	5	5
Retired or permanently disabled	6	6
Full-time student.	7	7
Housewife.	8	8

ASK OF REGISTRANT

c) What kind of work does (did) the registrant do in Canada?
(PROBE FOR EXACT DESCRIPTION OF OCCUPATION).

_____

_____

d) What kind of organization, business or industry (is, was) it?

_____

ASK ABOUT SPOUSE OF REGISTRANT

e) What kind of work does (did) the spouse of registrant normally do (in Canada)?

_____

_____

f) What kind of organization, business or industry (is, was) it?

_____

_____

(HAND R. CARD C)

11.a) Would you please look at this card and tell me which figure comes closest to the registrant's total income, that is, income for the past year - before taxes and deductions. Just tell me the letter next to the figures that fit it best. *(CODE UNDER 'a' BELOW)*

b) Which figure comes closest to spouse's total income? *(CODE UNDER 'b' BELOW)*

c) Code total "OHIP family" income under 'c'.

		a. Registrant	b. Spouse	c. OHIP "Family"
A	NO INCOME AT ALL	01	01	01
B	Less than $ 1999.	02	02	02
C	$ 2000 - $ 2999.	03	03	03
D	$ 3000 - $ 3999.	04	04	04
E	$ 4000 - $ 4999.	05	05	05
F	$ 5000 - $ 5999.	06	06	06
G	$ 6000 - $ 6999.	07	07	07
H	$ 7000 - $ 7999.	08	08	08
I	$ 8000 - $ 8999.	09	09	09
J	$ 9000 - $ 9999.	10	10	10
K	$10000 - $13999.	11	11	11
L	$14000 - $19999.	12	12	12
M	$20000 - $25000.	13	13	13
N	Over $25,000	14	14	14

ASK Q.12a ABOUT REGISTRANT

12. (a) What is the highest level of education that registrant has completed? *(CODE UNDER 'a' BELOW)*

(b) What is the highest level of education that the spouse has completed? *(CODE UNDER 'b' BELOW)*

	a Registrant	b Spouse
Primary School (no Graduation/Certificate . .	1	1
Primary School (with Graduation/Certificate .	2	2
High School (no Graduation/Certificate) . . .	3	3
High School (with Graduation/Certificate) . .	4	4
Technical training beyond secondary school. .	5	5
Some college or university.	6	6
University degree or beyond	7	7
DK.	8	8

(IF RESP. HAD NO INCOME IN 1974, GO TO Q.17.
OTHERS ASK:)

13.a) Did you yourself pay any income tax in 1974?

Yes 1
No *(GO TO Q.15)* 2

b) How much income tax? $_____

14. How much of your total personal income tax goes to the Ontario Government?

$_____or_____%

DK 99998

15. How much do you think you personally paid in Ontario sales tax last year?

under $200 01
$201. - $400. 02
$401. - $600. 03
$601. - $800. 04
$801. - $1000 05
$1001. - $1200. 06
$1201. - $1500. 07
over $1500. 08
DK. 98

16. Do you feel that you are "getting your money's worth" for the provincial taxes you pay?

Yes. 1
No 2
DK 8

(HAND R. CARD D)

17. The recent provincial budget shows the following breakdown of how each tax dollar was spent.

Health: 28¢
Education: (to school boards for primary and secondary) 17¢
Colleges & Universities: 10¢
Social and Community Services 8.5¢
Transportation and Communication 9.5¢
Transfers to local government: 13¢
Other: General administration, interest on government debt etc.) 14¢

What is your feeling about how each tax dollar is spent as far as...

	Too Little	Too Much	Just Right	DK
...health.	1	2	3	8
...education	1	2	3	8
...colleges & universities .	1	2	3	8
...social & community services.	1	2	3	8
...transportation.	1	2	3	8
...transfers to local government . .	1	2	3	8
...other	1	2	3	8

18. To what ethnic or cultural group do you or your ancestors on the male side belong? *(DO NOT ACCEPT CANADIAN)*

English. 01
French 02
German 03
Irish. 04
Italian. 05
Native Indian-Band 06
Non-Band 07
Dutch (Netherlands). 08
Norwegian. 09
Polish 10
Scottish 11
Ukrainian. 12
Other (specify)_____
DK 98

THANK YOU VERY MUCH FOR YOUR CO-OPERATION

It is possible that the Survey Research Centre may wish to call and verify that I have completed the interview. May we please have your phone number:

_____

Thank you.

Appendix D

SAMPLE DESIGN AND RELATED ASPECTS OF THE HOUSEHOLD SURVEY

THE COVERAGE OF THE SURVEY

The data were collected from a probability sample of the population of all 'OHIP families' in Ontario. For this survey an OHIP family was defined to be a person or persons whose medical bills were collected under one OHIP insurance number during the 12-month period from April 1 1974 to March 31 1975.

The four basic types of OHIP families are described in appendix C. Each OHIP family consisted of the registrant, the person whose name appeared on the OHIP card and who directly or indirectly paid the premiums for the OHIP coverage, and the immediate members of the registrant's family - spouse, sons, daughters. The registrant was called the head of the OHIP family. It is to be noted that divorced families can be covered under the same OHIP number, but this is not usually the case for common-law marriages.

Sample frame

The probability sample of OHIP families obtained in this survey was based on a stratified multistage cluster sample design. The population of OHIP families was stratified or subdivided into a number of strata or subpopulations in each of which probability subsamples of OHIP families were independently taken. The stratification actually employed will be described in more detail in the next section.

For purposes of economy, the sample design employed clustering of the OHIP families, that is, each OHIP family uniquely belongs to a household, which in turn uniquely belongs to an address, which in turn uniquely belongs to a census Enumeration Area (EA).

> In general, the economy of clustering is attributable to the savings in the interviewers' travel costs and in related expenses due to the geographic proximity of the sampled elements (OHIP families). However, this saving is usually counterbalanced by a decrease in the precision of statistical estimates associated with the items of interest in a survey. The loss in precision is due to the fact that the sampling units within a cluster usually tend to be more alike in the items of interest than the sampling units within the population. As a compromise between survey costs and statistical precision, multistage cluster sampling is an effective design for obtaining a specified amount of information at minimum cost (Lansing and Morgan, 1971).

A multistage sample design was necessary because there is no frame listing the OHIP families comprising the population. A frame listing the EA's in the province was available ('Enumeration Area User Summary', provided by Statistics Canada and contained in the 'Canadian Census Data Management System' developed by the Institute for Behavioural Research, York University). Thus it was possible to obtain a probability sample of EA's. In this survey, the EA's were the first-stage or primary sampling units (PSU). The addresses of dwellings within each sampled EA were then enumerated. These addresses, comprising the second-stage sampling units, were sampled at specified rates. The households within each sampled address were then enumerated. These households, comprising the third-stage sampling units, were sampled at specified rates. The OHIP families within the sampled households constituted the fourth-stage sampling units. These were sampled in a manner described in the section on sample selection. The last-stage sampling is necessary because the basic unit of analysis for the study is not the household but an OHIP family as defined rather narrowly in appendix C.

Stratification by family income

It was intended that health utilization patterns be investigated in relation to family income and to physician and hospital availability conditions facing different population

groups. In order to achieve a sample of OHIP families whose composition with respect to the two factors levels of income and physician and hospital availability conditions satisfied the requirements of the study, these two factors were used initially to stratify the population of OHIP families into subpopulations of interest.

Of the two factors, the stratification by level of family income was of greater interest. In total, there were five income superstrata: $0-4,999, $5,000-9,999, $10,000-14,999, $15,000-19,999, and over $20,000. The data on family income came from IBR's 1971 Census Data Bank holdings (Canadian Census Data Management System). In fact a 'household income' was used as a proxy for family income, with which it is highly correlated. The income stratification of OHIP families was not pure (i.e. some OHIP families were not placed in the correct income superstratum), because no frame listing all the OHIP families and their family income was available, while, at best, the average 1971 household incomes for each EA in the province were available. This information was used to allocate each EA, and thus all the OHIP families located within the EA, to one of the five income superstrata.

Stratification by the availability of physician and hospital resources

It has been argued that an abundance of physicians can affect utilization of medical services through physician-induced demand for services. This is possible on the assumptions of consumer ignorance regarding the appropriate amounts or types of medical services needed and income-maximizing or income-satisficing behaviour on the part of physicians. In Ontario there are practically no direct charges for medical services to the patient, and where physicians are in excess supply many of the indirect costs of medical services, such as waiting time, travel time, and transportation costs, can be minimized. Thus one can reasonably expect the utilization rates of medical services to be responsive to the

availability of physicians. It is also widely believed that the supply of hospital beds determines hospital utilization rates through the admission rate and the average length of stay (Roemer, 1961).

One way to control for and examine the possible variation in the utilization of health care services due to these factors is to stratify the sample according to some criteria of physician and hospital bed availability. Because the sample was small and had already been stratified into five income classes, it could not be subjected to two further stratifications i.e. one for physician supply and one for hospital bed supply. Stratification on the basis of a combination of medical and hospital resource availability was thus attempted.

Adequate quantification of the availability of medical and hospital resources by location was hampered by data difficulties. In the case of medical manpower, consideration was restricted to doctors who practise on a fee-for-service basis and are 'active' in OHIP terms. Not having adequate data on the availability of alternative medical manpower is unfortunate. There may well be, particularly in those areas that are presumed to be underdoctored (as measured by some standard doctor-population ratio), nurse practitioners or paramedical personnel who assist and greatly augment a physician's productivity, so that the effective physician supply will be higher than is implied by physician data alone.

OHIP considers a physician to be active in a particular time segment (usually a month) if he makes a claim to OHIP for services rendered within that period. The OHIP physician data are as follows: for a given month the data on all physicians, broken down into general practitioners and specialists, are given for each location (town, city, township) within each county. A population estimate for each location is given, together with the number of registered and active physicians. Because of the problem of seasonality, May 1974 was chosen as an average month. If OHIP data for each month were used, a much more accurate estimate of physician availability could be made, but that was not feasible for reasons of money and time.

Data on the availability of hospital bed supply were available for almost all public hospitals, private and federal hospitals, licensed nursing homes, and Ontario psychiatric hospitals. The key locations, of course, were general hospitals, whose operation the Hospital Insurance Plan essentially covers. The present study is primarily concerned with the use of these hospitals by the sample families, but the availability of related facilities, which could affect the utilization of a given supply of general hospital beds, had to be taken into account as well. Adequate data on extended care institutions such as chronic and convalescent hospitals were not available at the time the stratification exercise was undertaken.

Although there is some doubt about using population/doctor ratios as a measure of supply, this seemed the only practical approach, and considerable leeway was given when applying them. No distinction between part-time or full-time active physicians could be made. Also, the locations themselves are the mailing addresses of the listed physicians, and some doctors receive their mail at their offices and others at their homes. Presumably this explains certain anomalies; for instance, Agincourt has a ratio of more than one doctor to fifty people, a problem particularly severe in the larger centres like Toronto, Hamilton, Ottawa, and London. It was hoped that the OHIP data of active physicians would be sufficient to rule out the spurious or apparent oversupply of doctors near medical schools. These places are adequately supplied anyway, and shortages occur chiefly in smaller centres of 10,000 people or less which are remote from a large centre. Physicians who receive their mail in these locations are assumed to work there also.

The total number of beds of all the hospitals within a particular centre is taken to be the measure of availability of hospital facilities. These, of course, had to be related to the size of the community or, more precisely, to the size of the catchment area, a task done entirely in the Ministry of Health. The 'desired' beds per thousand population varied from one location to another on the basis of the age and sex

distribution of the service population. The Ontario average worked out to be approximately five beds per thousand population. Comparing the actual bed availability in each location with the desired beds yielded a surplus or deficit. The Ministry views these estimates as strictly confidential, because they are in part the basis for decisions to reduce the over-all hospital bed supply in Ontario.

The provincial population/doctor ratio works out to be 620:1. Since there is evidence that this is a desirable proportion and since it is a province-wide average, it was accepted as the adequate level. An area was then classified as undersupplied if the ratio was approximately 750:1 or higher and if another doctor could be supported. One place might have a population of 800 with one doctor but be unable to justify a second. Another place without a doctor and having a population less than, say, 400 might or might not be included as underserviced. Areas were considered to be oversupplied if the ratio was less than 450:1. In some places, predictably, only a fraction of the doctors were active in May 1974, so that whenever a shortage appeared the number of registered doctors was also considered.

Any underserviced area less than 25-30 miles away from a centre with adequate or more than adequate resources was reclassified as adequate.

Areas were finally classified as underserviced if they had inadequate supply, and as overserviced if there was an excess, of both doctors and beds. Locations with a sufficient or excess number of doctors but an inadequate bed supply were classed as adequate; the opposite situation, adequate beds with inadequate physician supply, was very rare.

As might be expected most of the Ontario population has adequate available health care resources. The inadequate locations are mainly in northern regions of the province, whereas excess supply locations are to be found only in southern Ontario.

Thus each EA in the province (and all the OHIP families located within the EA) was classified according to type of physician and hospital supply condition. The income and supply stratifications of OHIP families resulted in fifteen possible 'income x supply' strata being constructed. After a preliminary investigation of the 1971 Census data, the number of possible 'income x supply' strata was reduced to twelve, that is, no EA's were allocated to three strata: $0-4,999 x inadequate, $15,000-19,999 x inadequate, and over-$20,000 x inadequate. Since the income stratification was not pure, there may well be OHIP families classified as inadequate with respect to physician and hospital supply conditions and with incomes in the brackets $0-4,999, $15,000-19,999, and over $20,000.

Within the adequate and excess supply superstrata, a further stratification based on urbanization was introduced to allow independent analysis of the data in terms of the degree of urbanization. The EA's within each of the five 'income x adequate' strata in the adequate supply superstratum were stratified according to whether they were located in a Census Metropolitan Area (CMA) or otherwise, i.e. a CMA substratum and a remainder substratum were constructed in each of the five 'income x adequate' strata. The names of the CMA's involved are confidential to the Ministry of Health. In addition, the EA's in the remainder substrata located in the $5,000-9,999 x adequate and $10,000-14,999 x adequate strata were further stratified according to whether they were located in a population centre of under or over 10,000. The EA's within each of the five 'income x excess' strata in the excess supply superstratum were stratified according to whether they were geographically located in a particular CMA or otherwise, that is, a CMA substratum and a remainder substratum were constructed in each of the five 'income x excess' strata. The remainder substratum in the $0-4,999 x excess stratum contained too few households for any reasonable sampling, so it was

amalgamated with the remainder substratum in the $5,000-9,999 x excess stratum. For the same reason, the remainder substratum in the over $20,000 x excess stratum was amalgamated with the remainder substratum in the $15,000-20,000 x excess stratum.

The final stratification with 1971 household counts for each superstratum, stratum, and substratum is given in Table D1. Altogether, there were twenty-two strata and substrata.

Sample allocation

The total number of OHIP families sampled was 1200. Taking into consideration an expected 65 per cent response rate, an initial sample size of 1800 was planned. Approximately equal numbers of OHIP families were to be sampled from each of the five income superstrata and a minimum of approximately 200 OHIP families from the inadequate supply superstratum. This resulted in a disproportionate allocation of a sample of 1806 OHIP families among the superstrata, strata, and substrata as given in Table D1. The selection and response rates are given in Table D2.

Since the sampling frame included the target population (eligible OHIP families) as a subpopulation, a number of selected households and OHIP families were found to be ineligible. Considering a 'dead' address as an ineligible household, it was found, from the unweighted field data, that there were 4.6 per cent such households among the 1867 selected households (see Table D3). Also, 3.2 per cent of the selected OHIP families were ineligible. Hence, although 1867 selected households produced a sample of 1294 OHIP families, giving rise to a completion rate of 69 per cent, the response rate with respect to the selected OHIP families was 75 per cent.

The general decrease in the planned and actual sample allocation among the five income superstrata (by increasing income level) was a result of the fact that the data used to stratify the population of OHIP families according to income was based on the 1971 Census. It was felt that such an

TABLE D1: Distribution of OHIP families by strata and substrata

Income Class	$0-4,999	$5,000 -9,999		$10,000 -14,999		$15,000 -19,999	$20,000+	Total
Urbanization Availability strata	0-100K	0-10K	10K-100K	0-10K	10K-100K	0-100K	0-100K	
ADEQUATE	1	2	3	4	5	6	7	
Remainder	12,840	380,660	145,630	98,190	161,695	23,410	6,915	829,340
	8	9		10		11	12	
CMA	3,575	258,215		273,010		45,105	11,475	591,380
Subtotal	16,415	784,505		532,895		68,515	18,390	1,420,720
		13		14				
INADEQUATE		15,600		17,710				33,310
EXCESS		15		16		17		
Remainder		73,630		58,325		12,270		144,225
	18	19		20		21	22	
CMA	13,340	255,175		279,420		49,155	32,835	629,925
Subtotal	13,340	328,805		337,745		61,425	32,835	774,150
TOTAL	29,755	1,128,910		888,350		129,940	51,225	2,228,180

TABLE D2: Selection and response rates of OHIP families by strata and substrata

Income Class	$0-4,999		$5,000-9,999			$10,000-14,999			$15,000-19,999		$20,000+		Total	
Urbanization Availability strata	0-100K		0-10K		10K-100K	0-10K		10K-100K	0-100K		0-100K			
ADEQUATE														
Remainder	160(4)	148	90(6)	75	30(2) 25	30(2)	31	30(2) 25	60(4)	54	30(2)	30	430(22)	388
	176	0.84	104	0.72	28 0.89	33	0.94	28 0.89	70	0.77	43	0.70	482	0.80
CMA	60(4)	43	60(4)		54	90(6)		65	120(8)	89	60(4)	48	390(26)	299
	57	0.75	80		0.68	90		0.72	128	0.70	65	0.74	420	0.71
Subtotal	220(8)	191	180(12)		154	150(10)		121	180(12)	143	90(6)	78	820(48)	687
	233	0.82	212		0.73	151		0.80	198	0.72	108	0.72	902	0.76
INADEQUATE			160(8)		107	160(8)		126					320(16)	233
			156		0.69	161		0.78					317	0.74
EXCESS														
Remainder			30(2)		29	30(2)		21	30(2)	30			90(6)	80
			36		0.81	29		0.72	33	0.91			98	0.82
CMA	180(12)	68	48(4)		28	72(6)		41	96(8)	64	180(12)	93	576(42)	294
	177	0.38	44		0.64	79		0.52	95	0.67	155	0.60	550	0.53
Subtotal	180(12)	68	78(6)		57	102(8)		62	126(10)	94	180(12)	93	666(48)	374
	177	0.38	80		0.71	108		0.57	128	0.73	155	0.60	648	0.58
TOTAL	400(20)	259	418(26)		318	412(26)		309	306(22)	237	270(18)	171	1,806(112)	1,294
	410	0.63	448		0.71	420		0.74	326	0.73	263	0.65	1,867	0.69

TABLE D3: Over-all interview completion for the survey

Selected addresses	1815	
Multiple households	52	
Total selected households	1867	
	N	%
Completed interviews	1294	69.3
Absent households	126	6.7
Absent respondents	6	0.3
Dead or vacant addresses	86	4.6
Household refusal	186	10.0
Respondent refusal	15	0.8
Refused OHIP numbers	15	0.8
Ill or aged	49	2.6
Language problems	22	1.2
Not eligible	59	3.2
Others	9	0.5
Total	1867	100.0

NOTE: While the number of completed interviews is 1294, the number of interviews usable for statistical analysis is 1290. Four of the interviews contained errors that made them invalid for the study (see addendum to this appendix).

allocation would better suit the actual changes in income which had taken place over the past four years.

The sample allocation among the strata and substrata within an income superstratum, excluding the $5,000-9,000 x inadequate and $10,000-14,999 x inadequate strata making up the inadequate supply superstratum, was kept as proportionate as possible.

Sample selection

For each substratum and for stratum not subdivided into substrata the sampling rate of households (the desired number of households and OHIP families to be sampled was the same, since one OHIP family per household was to be selected) was computed at the ratio of the substratum or stratum number of households to be sampled and the substratum or stratum total number of households as given by the 1971 Census.

Within each substratum and each stratum not subdivided, the sampling procedure was such that each household had approximately the same chance of selection as given by the sampling rate of households within the substratum or stratum. This was achieved as follows. First, the number of PSU's (i.e. EA's) to be sampled was decided upon, as given in Table D2. Basically, it was decided that fifteen households per EA were to be sampled, increased to twenty for those EA's in the two strata making up the inadequate supply superstrata and to forty for those EA's in the remainder substratum in the $0-4,999 x adequate stratum. These particular increases were made to reduce the total number of EA's selected and concentrate the fieldwork, particularly in the latter case. A decrease to twelve was made for those EA's in the three CMA substrata located in the $5,000-9,999 x excess, $10,000-14,999 x excess, and the $15,000-19,999 x excess strata. These decreases were made to reduce the total number of households selected. The reason these three particular substrata were selected for decreases was that the total number of households allocated to the five CMA substrata located in the excess supply superstratum

was substantial and could better withstand a reduction in sample size than any other group of substrata.

The required number of EA's within each substratum and each stratum not subdivided were then selected with replacement, and with probabilities proportional to the number of households that they contained, as given by the 1971 Census data. For the selected EA's, their 1971 household counts were then used to compute the rate at which households within them would have to be sampled in order to obtain the desired twelve, fifteen, twenty, or forty households, depending on the substrata or strata to which the selected EA's belonged. Using the computed EA household sampling rates, a systematic selection of households with independent random starts was made in each of the selected EA's. In general, such a method of sampling permits, within moderate limits, a reasonable control of the sample size of households within selected EA's, while maintaining an approximately equal chance of selection of households within a substratum or stratum.

At each selected household an OHIP family was sampled using the following screening procedure. First, a household list recording members of the household in relation to the head was constructed by the interviewer. In general this involved listing the head, spouse, sons and daughters (in descending age order), other relatives, and other household members. For each household member the following information was recorded: sex, age as of January 1975, under 22 years and working full-time (yes or no), and marital status.

Each household member was then determined to be eligible for selection or not, according to the following eligibility criteria: the household member was over 22 years of age as of January 1975; the household member was under 22 years but had worked full-time from April 1 1974 to April 1 1975 (short periods of unemployment were allowed); the household member was married.

Then the eligible members of the household were numbered sequentially 01, 02, 03, etc., and an eligible member was selected by the interviewer using the random selection table

that had been provided by the Centre. Such a selection was also a chance selection of an OHIP family. By knowing how many of the eligible household members numbered sequentially belonged to the OHIP family associated with the selected eligible member, the probability of selection of the OHIP family could be computed as this number over the total number of eligible household members which were numbered sequentially.

If the selected OHIP family was ineligible (e.g. effective date of OHIP number is after April 1974) then the interview was terminated if this was the only OHIP family in the household; otherwise the eligible household members in the remaining OHIP families were renumbered sequentially and another eligible member and his or her associated OHIP family were selected. As seen from Table D2 1294 OHIP families were successfully interviewed, of which 21, or 1.6 per cent, were reselections.

If a selected OHIP family was eligible and consisted of at least a husband and wife the husband was selected for the interview. If the husband was not at home the wife was interviewed. If there was more than one household at an address, an interview was conducted at each one (up to 10).

STATISTICAL ESTIMATES: THE WEIGHTED SAMPLE

To the extent that the survey data are based on a probability sample of the population of OHIP families about which conclusions are to be drawn, the procedures of how to make statistical estimates from sample to population will now be dealt with.

In 'epsem' sampling (in which every element has the same probability of appearing in the sample) the straightforward proportions and averages calculated from the sample provide estimates of the population values. But when the sample is not epsem, the sample values have to be weighted in the analysis to correct for the unequal selection probabilities. For example, if the sampling rate of households in one particular substratum was three times that of the rate of another substratum, the sampled households in the latter substratum should be weighted

three times those in the former substratum in any tabulations based on the total sample data. It is usually necessary to assign weights which will either decrease the over-all representation of oversampled elements or increase the representation of those undersampled.

The sample of OHIP families selected in this survey was not epsem for a number of reasons. First of all, in the substrata or strata, for those strata not subdivided, sampling rates of households were not uniform, because of the disproportionate allocation of the sample of 1806 OHIP families.

Secondly, within each substratum and each undivided stratum the sample of households was approximately epsem. The reason for this is as follows. Suppose that in substratum or stratum h (h = 1, 2, ..., 22), an epsem sample of m_h households is to be selected. Based on 1971 Census data, suppose the estimated number of households in substratum or strata h is M_h. Then the household sampling rate for substratum or stratum h is $f_h = M_h/M_h$. Suppose n_h PSU's (i.e. EA's) are to be sampled with replacement and with probabilities proportional to the number of households M_{hi} ($i = 1, 2, \ldots, n_h$) that they contained as given by the 1971 Census data, and then to be subsampled at rates f_{hi} ($i = 1, 2, \ldots, n_h$) to achieve the desired epsem sample of m_h households. To those households selected at rate f_{hi} in the ith selected EA the correct weight to apply is

$$W_{hi} = M_h/n_h M_{hi} \cdot 1/f_{hi}, \quad (i = 1, 2, \ldots, n_h). \qquad (1)$$

To obtain an epsem or self-weighting sample, it would be necessary that W_{hi} ($i = 1, 2, \ldots, n_h$) be all equal and such that

$$W_{hi} = M_h/n_h M_{hi} \cdot 1/f_{hi} = 1/f_n = M_h/m_h, \qquad (2)$$

$$(i = 1, 2 \ldots, n_h).$$

Having selected n_h EA's equation (2) can be used to determine

the n_h household sampling rates f_{hi} ($i = 1, 2, \ldots, n_h$) within the individual selected EA's:

$$f_{hi} = m_h/n_h M_{hi}, \ (i = 1, 2, \ldots, n_h). \qquad (3)$$

Since households are to be sampled systematically within the n_h selected EA's, it would be convenient if the n_h sampling intervals $1/f_{hi}$ ($i = 1, 2, \ldots, n_h$) are integral numbers. If this is not the case, the f_{hi} ($i = 1, 2, \ldots, n_h$) are appropriately adjusted to new sampling rates f_{hi}' ($i = 1, 2, \ldots, n_h$) where $1/f'_{hi}$ is equal to $1/f_{hi}$ when $1/f_{hi}$ is rounded to the nearest integral number. Because of this adjustment and (2) the new adjusted weights W_{hi}' ($i = 1, 2, \ldots, n_h$) given by

$$W_{hi}' = M_h/n_h M_{hi} \cdot \ 1/f_{hi}', \ (i = 1, 2, \ldots, n_h) \qquad (4)$$

are only approximately equal, so that within the particular substratum the sample of households is only approximately epsem.

A third reason why the sample OHIP families must not be treated as an epsem or self-weighting sample is that an adjustment in the weights W_{hi}' has been made to account for household non-response. In the course of the survey, approximately 30 per cent of the selected households were not interviewed for such reasons as the following: the selected household was not at home at the three or four times when the interviewer called; the selected household respondent refused to be interviewed; or the interview was not conducted because of the selected household respondent's illness, age, language, or illiteracy. Such households were classified as non-respondent. The remainder of the selected households were classified as respondent households, including as a special case those selected households which did <u>not</u> have an OHIP family.

The presence of non-respondent households in the sample implies that any weighted estimates of items of interest in the population based only on the respondent households will be biased if the non-respondent households have special

characteristics. In the case of sample counts or totals, the estimates will obviously tend to fall short of the corresponding population quantities. In the case of sample means or proportions, the non-response bias will, as a general rule, be greater the greater the proportion of non-respondent households, and will also be greater the greater the difference in the corresponding population means or proportions between the respondent households and non-respondent households. This difference is, of course, neither known nor easily accessible to the investigator. A more intensive effort in fieldwork to obtain a random sample of the non-respondent households is the only guaranteed remedy for non-respondent biasing effects. This procedure, however, usually turns out to be very costly and time-consuming.

A much simpler, but theoretically less satisfactory, approach to the problem of non-response is to 'correct' the weights W_{hi}' by uniformly distributing the weights of the non-respondent households among the respondent households in substratum or stratum h. This non-response distribution device is based on the assumption that the non-respondent households are similar, in relevant characteristics, to the respondent households in the same substratum or stratum.

The method used to compute the correction factor for household non-response in substratum or stratum h (h = 1, 2, (...,) 22) was as follows. First, statistical estimates of the total number of households and the total number of potentially respondent households were computed using the formulas

$$\sum_{i=1}^{n_h} W_{hi}' \, x_{hi},$$

and

$$\sum_{i=1}^{N_h} W_{hi}' \, Y_{hi},$$

respectively, where x_{hi} and Y_{hi} denote the total number of selected and respondent households respectively in the ith selected EA (i = 1, 2, (...,) n_h). The ratio of these two

sample totals was the desired non-response 'correction' factor:

$$R_h = \sum_{i=1}^{n_h} W_{hi}' \, x_{hi} \Big/ \sum_{i=1}^{n_h} W_{hi}' \, y_{hi} \qquad (5)$$

Using this correction factor new weights $W_{hi}"$, adjusted for non-response, can be computed using the formula

$$W_{hi}" = W_{hi}' \cdot R_h \cdot \qquad (6)$$

A fourth reason why the sample of OHIP families must not be treated as an epsem or self-weighting sample is that the weights $W_{hi}"$ are appropriate for making statistical estimates in terms of the third-stage units (i.e. households) but are to be further adjusted if statistical estimates in terms of the fourth-stage units (i.e. OHIP families) are desired.

The screening procedure outlined above in the section on sample selection makes the following OHIP family adjustment to the household weight $W_{hi}"$ appropriate for the jth selected household (which contained at least one OHIP family) in the ith selected EA (whose households were sampled at rate f_{hi}') in stratum h. Suppose there were, in total, b_j eligible members of the household listed by the interviewer for the jth selected household and suppose a_j of these members belonged to the OHIP family associated with that eligible household member selected at random by the interviewer. To this selected OHIP family, the correct weight to apply is

$$W_{hij} = W_{hi}" \cdot b_j/a_j \qquad (7)$$

Since, in principle, non-response can occur at one or more stages of selection it is usually advisable to compute a non-response correction at each stage. In the present study, non-response was encountered at the household selection and the OHIP family selection stages. The correction factor at the

OHIP family selection stage is identical in form to the household non-response correction factor (equation 5), except that x_{hi} is replaced by

$$\Sigma(b_j/a_j)$$
$$j$$

for the respondent households which contain at least one OHIP family and for which the quantities a_j and b_j are known, and y_{hi} is replaced by

$$\Sigma' (b_j/a_j)$$
$$j$$

for the respondent households which contain at least one OHIP family and for which there was an OHIP family response.

The final field report indicates that there were, at most, 116 non-respondent OHIP families, and most of these occurred at households where only one OHIP family was eligible for selection. The effect of this was that the product of correction factors at each stage would not differ significantly from the corresponding correction factors that combined the non-response over the two stages by making no distinction between household and OHIP family non-respondents. The relative simplicity of the latter and the quantitative similarity of both procedures resulted in the computation of a set of combined non-response correction factors aggregated at the stratum or substratum level. Hence it was decided to use equation (5) with the modification that x_{hi} and y_{hi} denote the total number of selected and respondent OHIP families respectively in the ith selected EA in stratum h.

The method of making statistical estimates from the survey data (i.e. weighting the survey data) is straightforward. The method (except for the weights) is the same whether households or OHIP families are the respondents. In general, the term 'unit' will be used for either a household or an OHIP family.

In order to estimate the population <u>count</u> of units with certain characteristics, the weights for all respondent units

with these characteristics are simply added. For example, an estimate of the total number of households in Ontario which contain at least one OHIP family is given by

$$\sum_{h=1}^{22} \sum_{i=1}^{n_h} \sum_{j} W_{hi}",$$

where the index j refers to the jth selected household in the ith selected EA in stratum h. Also, an estimate of the total number of OHIP families in Ontario is given by

$$\sum_{h=1}^{22} \sum_{i=1}^{n_h} \sum_{j} W_{hiji}.$$

In order to estimate the population <u>total</u> of a variable for all units with certain characteristics, the products of the variable times the weight for all units with these characteristics are summed. In general, the population count, C_A and the population total of variable x, T_{xA}, are given by

$$C_A = \sum_{h=1}^{22} \sum_{i=1}^{n_h} \sum_{j \in A} W^*_{hij}, \qquad (8)$$

$$T_{xA} = \sum_{h=1}^{22} \sum_{i=1}^{n_h} \sum_{j \in A} x_{hij} W^*_{hij}$$

where W^*_{hij}, the adjusted weight of respondent unit j in EA i in stratum h, is given by

$$W^*_{hij} = \begin{cases} W_{hi}" & \text{(for respondent households)} \\ W_{hij} & \text{(for respondent OHIP families).} \end{cases} \qquad (9)$$

A is the set of respondent units with the specified characteristics, and x_{hij} is the value of variable x for respondent unit j, in EA i in stratum h. It is to be noted that a population count C_A is a special case of a population total T_{xA}, where the variable x is defined by

$$x_{hij} = \begin{cases} 1, & , j \in A , \\ 0, & , j \notin A . \end{cases} \qquad (10)$$

Ratios of the following form may be computed:

$$R_{AB} = C_A/C_B,$$

$$R_{xA} = T_{xA}/C_A,$$

$$R_{xyA} = T_{xA}/T_{ya}. \qquad (11)$$

For example, suppose A refers to the set of OHIP families with family incomes in the range $0-4,999, and B refers to the set of all OHIP families. Then R_{AB} is an estimate of the proportion of all OHIP families with family incomes in the range of $0-4,999. If the variable x refers to annual costs of prescription drugs, then R_{xA} is an estimate of the average cost of prescription drugs among those OHIP families with family incomes in the range of $0-4,999. If the variable y refers to OHIP family annual income, then R_{xyA} is an estimate of the proportion of OHIP family annual income spent for prescription drugs among those OHIP families with family incomes in the range of $0-4,999.

ADDENDUM

Two minor changes should be made to the final sample of 1294 OHIP family interviews for reasons which came to light only after weighting tabulations were completed. It has been

discovered that two of the 1294 OHIP numbers associated with the 1294 completed OHIP family interviews are erroneous. With respect to Tables D1 and D2, one of these two OHIP family interviews was among the twenty-nine completed interviews in substratum 15 and the other was among the forty-one completed interviews in substratum 20. These two OHIP families have subsequently refused to give their correct OHIP numbers. Also, an additional two OHIP numbers were found not to be valid over the whole twelve-month study period. One number was among the sixty-five interviews of substratum 10, the other among the ninety-three interviews of substratum 22.

With respect to any analysis of the survey data involving the use of OHIP numbers, these four OHIP family interviews should not be included and should be considered non-respondents. Since the resulting increases in the non-response correction factors R_{10}, R_{15}, R_{20}, R_{22} are insignificant, no changes in the statistical weights $W"_{hi}$ and W_{hij} (h = 10, 15, are required.

Appendix E

DECISION RULES FOR TRANSFORMING THE PHYSICIAN CLAIMS RECORDS

INTRODUCTION

As mentioned in chapter 4, the information in the study was in the form of physician claims made to OHIP for services given to patients covered under the medical insurance plan in Ontario. This raw data was much too detailed for our purposes and had to be transformed, i.e. aggregated to yield a more manageable set of information required for the present analysis. This appendix describes in detail the many decision rules adopted to transform the physician claim data into the desired aggregate information.

TYPE OF SERVICE

The categories of different services are as follows: minor surgery; major surgery; X-rays, labs, nuclear medicine, etc.; diagnostic and therapeutic procedures; obstetrics-gynecology and birth services; visits; and practitioner services. Each is now considered in turn.

Minor and major surgery

This category pretty well covers 'surgical procedures' as defined in the Schedule of Fees. It includes prefixes D (dislocations and manipulations), E (organs of special senses), F (fractures), M (respiratory), N (nervous system), R, S, Z (various and sundry), R (dental). These prefixes cover a little too much. Thus Z001 to A091 (nuclear medicine) is exluded. In many operations several physicians participate as surgeons, assistants, and anaesthetists. The resulting claims are considered one service if they are made out for the same day. However, the cost components will include the costs for

each claim, including time for assistants (M400B) and anaesthetists (E100C). Both M400B and E100C are applicable only to claims made prior to 1 May 1974. Minor surgery is any surgical procedure with total cost less than $100; major surgery is the remainder.

X-rays, labs, nuclear medicine, etc.

This category includes prefixes X (diagnostic and therapeutic radiology), L (laboratory tests), J (clinical procedures associated with diagnostic radiological examinations, diagnostic ultrasound, pulmonary function studies), Y (special radiography) and Z001-Z091 (nuclear medicine). A special case of L700, which is not counted as a service though its cost components are included.

Diagnostic and therapeutic procedures

This category is comprised of prefix G (diagnostic and therapeutic procedures). Code G700 is not counted as a service but is included in the costs. Code G623 (certification) is excluded from this category.

Obstetrics-gynecology and birth services

This category includes prefix P (obstetrics) and also H001-H005, H261-H268 (baby care). All claims made on the same day are counted together as one service. However, all the costs are included in the cost for that service.

Visits

This category includes prefixes A (office visit), B (home visit), C (hospital visit), K (psychiatry and office visit), H (emergency department visit, physical medicine and rehabilitation), W (institutional care) and G623 (certification). Excluded from the above are H001-H005, H261-H268 (baby care).

Not counted as services but included in cost are K-1 (detention fees).

Practitioner services

This category consists mainly of services given by non-physicians which have V prefixes.

MEDICAL SERVICE PROVIDER

The provider is classed as general practitioner, primary care, gynecologist-obstetrician, other specialist, or practitioner. Each can be determined by the specialist code from the claims records. The categories do overlap, and the processing avoids double counting, since primary care includes not only general practitioner, but paediatrician, internist, and gynecologist-obstetrician.

SITE OF SERVICE

There are seven different locations of interest in the study: office, out-patient department, hospital, clinic, home, emergency department, and other institutions. These can be determined indirectly by taking into consideration the fee code prefix, the type of clinic (hospital association, departmental, other), and the presence of a hospital number.

Office

The service was given in the office if the prefix is not B, C, or W and neither clinic nor hospital number is present.

Out-patient

It is in the out-patient if prefix is A and clinic is hospital-associated.

Hospital

There are several different determinants. If any of the following are true then the service was given in a hospital:

> prefix is A and either clinic is departmental or hospital number exists with no clinic number; prefix is C; prefix is other than A, B, C, or W, code is non-emergency department, hospital number exists, or clinic is hospital-associated or departmental.

Clinic

Location is clinic if prefix is other than A, B, C or W, code is non-emergency department, clinic is other and hospital number does not appear. It is also clinic if prefix is A and clinic is other.

Home

Prefix B designates a home or special visit. Codes K005 and K265 are also counted as services.

Emergency department

If prefix is H and code is not H312-H319 (physical medicine and rehabilitation management), H001-H005, H261-H268 (baby care), H009 (convalescent care), then service was given in the emergency department.

Other institutions

Prefix W designates institutions such as nursing homes, chronic hospitals, etc. Also includes H009.

COST OF SERVICE

It was hoped that data on total, public, and private cost of the service could be obtained. The public cost of the

service is readily obtainable: it is 90 per cent of the OMA fee listed in the Schedule for each service. If the physician involved has opted out of the system, then it could be assumed that the amount billed is the amount that the patient has paid; and hence the private cost is the difference between the total and the public components. However, officials in the Ministry of Health warn that opted-out physicians do not have to report to OHIP the true amount billed to the patient. Thus the reliability of the 'amount billed' figure on the claim card cannot be taken for granted. Nor can it be assumed that the patient necessarily pays the difference between total and OMA fees. Nevertheless, the data on private cost as defined above were collected. Opted-in physicians cannot charge patients for services rendered unless they are not covered by the medicare program.

FURTHER COMMENTS ON SITE OF SERVICE AND MEDICAL SERVICE PROVIDER

A problem sometimes arises when several physicians are claiming for the same surgery or birth service (e.g. as surgeon, assistant, or anaesthetist). It is assumed that it is unlikely to have two surgeries or birth services on the same day. However this restriction creates a difficulty in deciding where the service was given and who gave it. Sometimes the location appears differently for different physicians. Also, sometimes more than one A suffix occurs.

The problem of different locations is handled by assuming that when two locations turn up the location nearest a hospital is the one decided upon. More specifically, the decision goes to the location with the greatest weight. Locations and weights are as follows: hospital 7, out-patient 6, emergency 5, clinic 4, institution 3, office 2, home 1. The 'multiple who' problem is settled by taking the physician with the greatest weight, as follows: gynecologist-obstetrician 4, other specialist 3, other primary care 2, general practitioner 1.

RECORD FORMAT AND RATIONALE

Each record in the output file will consist of information pertaining to a service as previously defined. In order to avoid duplication, several services may be described in one record where all the information is common to all of them (e.g. lab tests on the same day). Each record will have the following form: sequence number, patient, date, who, what, where, service, costs. The sequence number is that of the contract under consideration; the patient is identified by age and sex; the date is that of the service given; 'who' is the medical service provider; 'what' is the medical service provided; 'where' is the location of the service provided; 'service' is the number of services in which the former information is exactly the same; and costs is a multidimensional component as discussed above.

AN ADDENDUM

Some time after the claims data were extracted and organized and the medical utilization file on the sample families prepared, in November 1975, it was discovered that according to the decision rules adopted for the exercise a number of services having both a technical and a professional component may be counted as two services rather than one. Furthermore the number of encounters could also be affected by such services. If one physician performed both components of the service it would be registered as one encounter. However, if two separate physicians performed the two components of a service, two encounters may be registered rather than one. In either case, of course, the cost figures are not affected at all.

Since the preparation of the utilization file is both expensive and time-consuming, it was not redone. According to the research carried out by the Ministry of Health the problem of overestimating encounters is very minor. The research concluded as follows:

Diagnostic radiology codes X001-X133, X501-X633, Y001-Y133, and Y501-Y633: the majority of these services - over 95 per cent - were claimed under one fee i.e. both technical and professional components were done by one physician.

Laboratory medicine codes L001A-L735A, L800A-L825A for professional components only: the volume of services under codes L800A to L825A is fairly small when compared to that for codes L001A to L735A.

Nuclear medicine - in vivo codes Z001-Z091: the percentage of these procedures being claimed by two physicians was less than 10 percent; the total volume of claims under nuclear medicine is extremely low compared to other procedure groupings i.e. laboratory medicine, diagnostic radiology, and electrocardiology.

Therapeutic radiology codes X301-X333: claims by two physicians seemed to vary between 40 and 60 per cent, but as for nuclear medicine the over-all volume of services is extremely low compared to other groupings.

Pulmonary function studies codes J200-J237: the number of services claimed by two physicians was 10 to 30 per cent between individual procedures; again the over-all volume is extremely small.

Diagnostic ultrasound codes J100-J180: same as for nuclear medicine.

Electrocardiology codes G310-G321, G334-G335: these services were more difficult to assess: 'the over-all volume compared to other services under diagnostic and therapeutic procedures is significant, and all that can be given here is a personal opinion, which is that the majority of claims are from the same physician'.(1)

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1 Personal Communication from Mrs L. Campbell, administrative assistant, Professional Services Monitoring Branch, Ministry of Health, 28 January 1976.

References

Abel-Smith, B. and P. Townsend (1965) The Poor and the Poorest (London: G. Bell and Sons Ltd)

Acton, J.P. (1973) 'Demand for health care among the urban poor with special emphasis on the role of time'. Rand Corporation Memorandum R-1151-OEO/NYC

Acton, J.P. (1975) 'Non-monetary factors in the demand for medical services: some empirical evidence.' Journal of Political Economy 83, 595-614

Aday, L.A. and R. Andersen (1975) Development of Indices of Access to Medical Care (Ann Arbor, Michigan: Health Administration Press)

Andersen, R. and J. Newman (1973) 'Societal and individual determinants of medical care utilization.' Milbank Memorial Fund Quarterly 51, 95-124

Anderson, U.M. (1970) 'Infant survival differentials in the city of Toronto: a challenge to health planning and research.' Canadian Family Physician 14, 45-50

Andreopoulos, S., ed. (1975) National Health Insurance: Can We Learn From Canada? (New York: John Wiley and Sons)

Arrow, K.J. (1963) 'Uncertainty and the welfare economics of medical care.' American Economic Review 53, 941-73

- (1965) 'Uncertainty and the welfare economics of medical care: reply (the implications of transaction costs and adjustment lags).' American Economic Review 55, 154-8

Badgley, R.F. et al. (1967) 'The impact of medicare in Wheatville, Saskatchewan, 1960-65.' Canadian Journal of Public Health, 58, 101-8.

Beck, R.G. (1973) 'Economic class and access to physician services under public medical care insurance.' International Journal of Health Services 3, 341-55

- (1974a) 'The effects of copayment on the poor.' Journal of Human Resources 9, 129-42

- (1974b) 'Some dynamic effects of copayment on utilization of medical services in Saskatchewan.' Paper presented for the Working Symposium of Canadian Health Care Economists, Queen's University

Beck, R.G. and J.M. Horne (1976) 'Economic class and risk avoidance: experience under public medical care insurance.' Journal of Risk and Insurance 43, 73-86

Becker, G.S. (1965) 'A theory of the allocation of time.' Economic Journal 75, 493-517

Berki, S.E. (1972) Hospital Economics (Lexington, Mass.: D.C. Heath and Co.)

Bird, R.M. and L.H. de Wulf (1973) 'Taxation and income distribution in Latin America: a critical review of empirical studies.' International Monetary Fund Staff Papers, 639-82

Blishen, B.R. (1958) 'The construction and use of an occupational class scale.' Canadian Journal of Economics and Political Science 24, 519-31

Blumstein, J.F. and M. Zubkoff (1973) 'Perspectives on government policy in the health sector.' Milbank Memorial Fund Quarterly: Health and Society 51, 395-431

Boulding, K.E. (1966) 'The concept of need for health services.' Milbank Memorial Fund Quarterly 44, 202-23

Buchanan, J. (1968) 'What kind of income redistribution do we want?' Economica 35, 185-90

Butler, N.R. and D. Bonham (1963) Perinatal Mortality - The First Report of the 1958 British Perinatal Mortality Survey (London: E. and S. Livingstone Ltd.)

Davis, K. and R. Reynolds (1975) 'Medicare and the utilization of health care services by the elderly.' Journal of Human Resources 10, 361-77

de Wulf, L.H. (1974) 'Fiscal incidence studies in developing countries: survey and critique.' International Monetary Fund, Fiscal Affairs Department

Economic Council of Canada (1968) Fifth Annual Review (Ottawa: Queen's Printer)

Edwards, A.L. (1957) Techniques of Attitude Scale Construction (New York: Appleton-Century-Crofts Inc.)

Enterline, P.E. (1973) 'The distribution of medical services before and after "free" medical care - the Quebec experience.' New England Journal of Medicine 289, 1174-78

Evans, R.G. and H.D. Walker (1972) 'Information theory and the analysis of hospital cost structure.' Canadian Journal of Economics 5, 398-418

Fein, R. (1972) 'On achieving access and equity in health care.' Milbank Memorial Fund Quarterly 1, 157-90

Feldman, J.J. (1968) The Dissemination of Health Information (Chicago: Aldine)

Feldstein, M.S., B. Friedman, and H. Luft (1972) 'Distributional Aspects of national health insurance benefits and finance. National Tax Journal 25, 497-510

Franzen, T., et al. (1975) 'Redistributional effects of taxes and public expenditure in Sweden.' Swedish Journal of Economics 77, 31-55

Fraser, H.N. (1968) 'Socio-economic status, morbidity, and the utilization of health resources.' University of Calgary, Alberta, MA Thesis

Fuchs, V.R., ed. (1972) Essays in the Economics of Health and Medical Care (New York: National Bureau of Economic Research)

Gillespie, W.I. (1975) 'The redistribution of income in Canada, 1969: an analysis of the incidence of taxes and public expenditures in the Canadian economy.' Carleton University, Ottawa, mimeograph

Goldberger, A.S. (1964) Econometric Theory (New York: John Wiley and Sons Inc.)

Goldfeld, S. M. and R. E. Quandt (1972) Nonlinear Methods in Econometrics (Amsterdam: North-Holland Publishing Co.)

Grossman, M. (1975) 'The correlation between health and schooling.' In N.E. Terleckyj, ed., Household Production and Consumption (New York: National Bureau of Economic Research)

Hardin, E. and M.E. Borus (1971) The Economic Benefits and Costs of Retraining (Lexington, Mass.: D.C. Heath and Company)

Hart, J.T. (1971) 'The inverse care law.' Lancet, 1, 405-12

Hewitt, D. and J. Milner (1975) 'Inequality of the services received by individuals: a suggested index and an illustrative application.' Medical Care 13, 928-33

Holahan, J. (1975) 'Physician availability, medical care reimbursement, and delivery of physician services: some evidence from the medicaid program.' Journal of Human Resources 10, 378-402

Holtmann, A.G. (1970) 'Prices, time and technology in the medical care market.' Journal of Human Resources 7, 179-90

Hyman, M.D. (1970) 'Some links between economic status and untreated illness.' Social Science and Medicine 4, 387-99

Johnson, J. (1968) The Incidence of Government Revenues and Expenditures (Toronto: Queen's Printer)

Johnston, J. (1960) Econometric Methods (New York: McGraw-Hill)

Klarman, H.E., ed. (1970) Empirical Studies in Health Economics (Baltimore, Maryland: The John Hopkins Press)

Lansing, J.B. and J.N. Morgan (1971) Economic Survey Methods (Ann Arbor, Michigan: Survey Research Center of the Institute for Social Research)

Lerner, M., G.W. Torrance, J.T. Gentry, and J.S. Mathews (1973) 'Viewpoints.' Health Services Research 8, 7-16

Lindsay, C.M. (1969) 'Medical care and the economics of sharing.' Economica 36, 531-77

Luft, H.S. (1975) 'The impact of poor health on earnings.' Review of Economics and Statistics 57, 43-57

McLure, C.E. Jr (1974) 'On the theory and methodology of estimating benefit and expenditure incidence.' Workshop on Income Distribution and Its Role in Development, Rice University, Texas.

- (1972) 'The theory of expenditure incidence.' Finanzarchiv 20, 432-53

Mechanic, David (1974) Politics, Medicine, and Social Science (New York: John Wiley and Sons Inc.)

Morgan, J. and J. Sonquist (1963) 'Problems in the analysis of survey data and a proposal.' Journal of the American Statistical Association 58, 415-35

Ontario Council of Health (1973) A Review of the Ontario Health Insurance Plan (Toronto: Ontario Council of Health)

Ontario Economic Council (1976) Health Issues and Alternatives 1976 (Toronto)

Ontario Medical Association (1974) 1974 Schedule of Fees (Toronto)

Orcutt, G.H., M. Greenberger, J. Korbel, and A.M. Rivlin (1961) Microanalysis of Socio-economic Systems: A Simulation Study (New York: Harper and Row)

Pauly, M.V. (1971) Medical Care at Public Expense, A Study in Applied Welfare Economics (New York: Praeger)

Prest, A.R. (1968) 'The budget and interpersonal distribution.' Public Finance 3, 86-7

Rein, M. (1969) 'Social class and the utilization of medical care services: a study of British experience under the National Health Service.' Hospitals, Journal of the American Hospital Association 43, 43-54

Richardson, W.C. (1971) 'Ambulatory use of physician's services in response to illness episodes in a low-income neighborhood.' Center for Health Administration Studies, Chicago, Research Series 29

Roemer, M.I. (1961) 'Hospital utilization and the supply of physicians.' Journal of the American Medical Association 178, 989-93

Royal Commission on Health Services (1964) Report of Royal Commission on Health Services (Ottawa: Queen's Printer)

Sonquist, J. and J. Morgan (1964) The Detection of Interaction Effects (Ann Arbor, Michigan: Survey Research Centre)

Special Program Review (1975) The Report of the Special Program Review (Toronto: Government of Ontario)

Spratt, J.S. Jr (1975) 'The relation of "human capital" preservation to health costs.' American Journal of Economics and Sociology 24, 295-307

Statistics Canada (1973) Occupations: Appendix - List of Occupation Codes and Titles (Ottawa: Information Canada), Catalogue 94-727, Vol. 3, Part 2, Bulletin 3.2-13

Stewart, W.H. and P. Enterline (1961) 'Effects of the National Health Services on physician utilization and health in England and Wales.' New England Journal of Medicine 265, 1187-94

Strauss, A.L. (1969) 'Medical organization, medical care and lower income groups.' Social Science and Medicine 3, 143-77

Stuart, B.C. and L.A. Blair (1971) 'Health care and income: the distributional impact of medicaid and medicare nationally and in the state of Michigan.' Michigan Department of Social Services, Research Paper 5, 2nd ed.

Suits, D.B. (1963) Statistics: An Introduction to Quantitative Economic Research (Chicago: Rand McNally and Company)

Thurow, L. (1975) 'The economics of public finance.' National Tax Journal 20, 185-94

Titmuss, R. (1968) Commitment to Welfare (London: Allen and Unwin)

Townsend, D. (1974) 'Inequality and the health service.' Lancet 1, 1180-90

Wan, T.T.H. and S.J. Soifer (1975) 'A multivariate analysis of the determinants of physician utilization., Socio-Economic Planning Sciences 9, 229-37

Weisbrod, B.A. (1964) 'Collective-consumption services of individual-consumption services.' Quarterly Journal of Economics 78, 471-7

Weiss, J.E. and M.R. Greenlick (1970) 'Determinants of medical care utilization: the effect of social class and distance on contacts with the medical care system.' Medical Care 8, 456-62

Wilensky, G.R. and J. Holahan (1972) National Health Insurance: Costs and Distributional Effects (Washington: The Urban Institute)

Wonnacott, T.H. and R.T. Wonnacott (1969) Introductory Statistics (New York: John Wiley)

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